

Alternate Futures for 2025



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Alternate Futures for 2025: Security Planning to Avoid Surprise



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Disclaimer

2025 is a study designed to comply with a directive from the chief of staff of the Air Force to examine the concepts, capabilities, and technologies the United States will require to remain the dominant air and space force in the future. Presented on 17 June 1996, this report was produced in the Department of Defense school environment of academic freedom and in the interest of advancing concepts related to national defense. The views expressed in this report are those of the authors and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States government.

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Executive Summary

The importance of long-range planning has never been greater due to the dwindling resources dedicated to defense, debates over roles and missions, and the changing security environment. In response to this need, the Air Force embarked on a wide-ranging effort to improve long-range planning. The Air University-hosted project **2025** looks 30 years into the future and identifies the systems, concepts of operation, and technologies required to ensure the US possesses the dominant air and space forces in the future.

In order to envision the world of 2025, the study had to make predictions. Futurists use several methods to "forecast" the future. The approach used for the **2025** study creates alternate futures by examining trends, studying the work of respected futurists, considering surprises and "wild cards," and conducting analyses to identify the factors, or "drivers," that will be major contributors to change.

To be effective for planning, these drivers must encapsulate the major forces likely to shape the world of 2025 and be relevant to the organization. After extensive analysis, the Alternate Futures team identified American Worldview, Δ TeK, and World Power Grid as the most important drivers affecting the future and relevant to air and space power. American Worldview is the US perspective of the world and describes American willingness and capability to interact with the rest of the world. Δ TeK is the differential in the rate of growth and proliferation of technology. World Power Grid describes the generation, transmission, distribution, and control of economic, political, and military power throughout the world. Each driver exhibits two extremes. American Worldview varies between "Domestic" or "Global," Δ TeK ranges from "Constrained" to "Exponential¹," and World Power Grid ranges from "Concentrated" to "Dispersed."

Using the interaction of these drivers, the Alternate Futures team created different visions of the future and defined a

strategic planning space (fig. ES-1). This planning space contains an infinite number of worlds. Selecting the worlds at the extremes of the drivers—the corners of the planning space—encompasses characteristics of all the worlds inside the space.

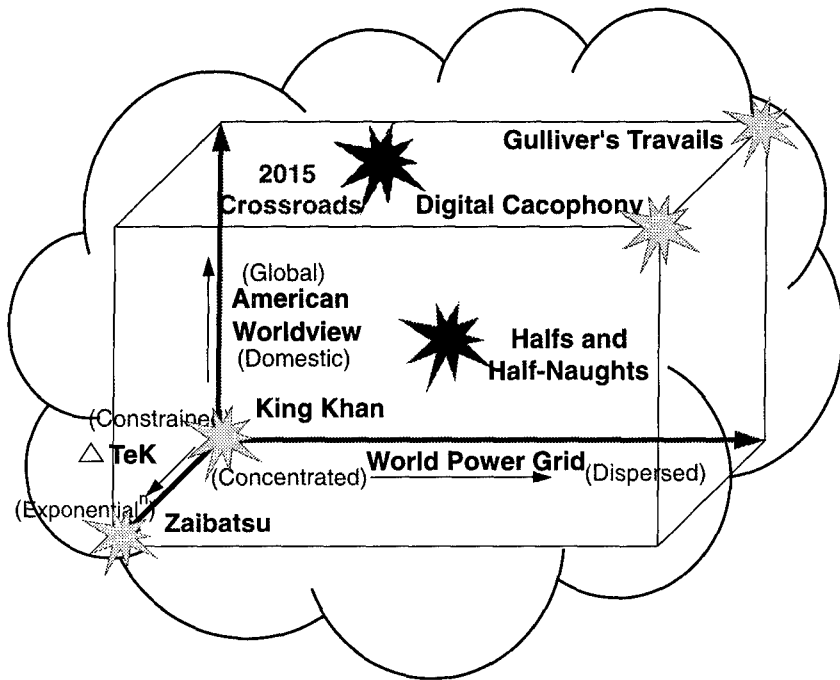


Figure ES-1. Strategic Planning Space

The Alternate Futures team then enriched the worlds by “backcasting” from 2025 to 1996 to build plausible histories. After finishing the plausible histories, the team added to the richness of each world and increased their robustness by deriving the nature of various features such as international politics, actors, environment, and technology.

From the eight worlds at the corners of the strategic planning space, the team selected the four futures most likely to be of interest to the primary customers of the **2025** study, the chief of staff of the Air Force (CSAF) and other senior decision makers. *Gulliver's Travails*, *Zaibatsu*, *Digital Cacophony*,

and *King Khan* provide challenging operating conditions for the US military and specifically for air and space forces.

In *Gulliver's Travails*, the US is overwhelmed and pre-occupied with worldwide commitments such as counter-terrorism and counterproliferation efforts, humanitarian or environmental assistance, and peacekeeping operations. This world forces the US military to devise systems and concepts of operation for meeting expanding requirements while maintaining a high operations tempo during a period of constrained budgets.

In *Zaibatsu*, multinational corporations dominate international affairs and loosely cooperate to create a superficially benign world. The main challenge for the US military in this world, which is becoming unstable due to rising income disparities, is to maintain relevance and competence in a relatively peaceful world.

Digital Cacophony is the most technologically advanced world, resulting in great power for the individual but also creating widespread fear and anxiety. The rapid proliferation of high technology and weapons of mass destruction provides individual independence but leads to social isolation. In this world, the US military must cope with a multitude of high technology threats, especially in cyberspace.

King Khan contains a strategic surprise, the creation of and dominance by an Asian colossus formed by China, Taiwan, Malaysia, Singapore, and Hong Kong. *King Khan* is also a world where US dominance has waned due to domestic problems, including an economic depression. The main challenge in this world is to determine which core competencies to retain during a rapid decrease in the defense budget followed by the challenge of deciding which capabilities to reconstitute, once defense budgets begin to rise.

The Alternate Futures team briefed these four worlds to the Air Force major command vice commanders in early January 1996. At their request, the Alternate Futures team created a fifth world using aspects common to all four alternate futures, to serve as a baseline for analysis. This fifth world, called *Halfs and Half-Naughts*, is a world of changing social structure and security conditions. The main challenge to the military is to

prepare for a multitude of threats in a world dominated by conflict between haves and have-nots.

Finally, the chief of staff of the air force requested a sixth world, to provide a “bridge” between today and 2025. This world, placed in 2015, uses programmed forces from 1996–2001 to fight a major conflict. The world is named *2015 Crossroads* because it presents the US with a strategic challenge in 2015 which could lead to several different worlds by 2025.

These six alternate futures form the foundation of the **2025** study by providing the fulcrum against which analysts applied operational analysis techniques. The purpose of the operational analyses was to determine which of the many ideas generated by the study participants merit further attention and possible development. The alternate futures provided the operating environment in which the various proposed systems, concepts, and technologies were evaluated. Another purpose of the alternate futures was to enhance creativity. In envisioning a particular world of 2025, study participants were sometimes faced with new challenges for military forces. These challenges fostered “over-the-horizon” thinking to develop new solutions. The Alternate Futures approach combined with the **2025** study effort seeks to ensure that the US will maintain air and space dominance in the future, regardless of what vision of the future becomes reality.

Chapter 1

Introduction

The past is of no importance. The present is of no importance. It is with the future that we have to deal. For the past is what man should not have been. The present is what man ought not to be. The future is what artists are.

—Oscar Wilde

To prepare for the future is as much an art as a science. This study contributes to the exercise of that art by systematically employing the Alternate Futures process in the creative environment of the **2025** study. This introduction delineates the specific purpose of the **2025** study and the Alternate Futures process, covers some terms specific to this research, and provides an overview of the analysis that follows.

Purpose

The objectives of the **2025** study were promulgated by the Air Force chief of staff in a tasking message to the Air University commander in December 1994:

The study team will generate ideas and concepts on the capabilities the United States will require to possess the dominant air and space forces in the future. . . . The final product will be a collection of white papers detailing findings regarding air and space capabilities required for future warfare, new or high-leverage concepts for employing air and space power, and the technologies required to enable the capabilities envisioned.¹

The Air University-hosted **2025** study is but one of several long-range planning initiatives currently under way within the Air Force. The problems encountered by most long-range planners are the difficulties of thinking “outside the box” and the pitfalls of simply using projections from today to predict the future. As a result of these problems, the common tendency is to create future operating environments that are similar to those of today. This constrained planning space, as

illustrated in figure 1-1, can lead to “rude surprises” as trends and events vary from the expected.

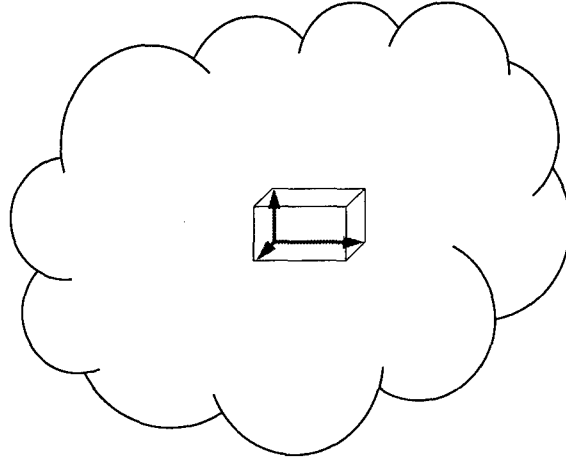


Figure 1-1. Traditional Long-Range Planning Space

In contrast to the traditional approach, the **2025** study included potential nonlinear changes. The key metric for the study was avoiding surprise. The Alternate Futures team achieved this by employing a process specifically designed to create a complete and robust set of planning environments.

These planning environments, or alternate futures, were used by the **2025** participants as a framework for analyzing and evaluating the different systems, concepts of operation, and technologies envisioned throughout the study. The six alternate futures detailed in this paper were also used to stimulate the development of new concepts and technologies. Substantial interchange between the original Alternate Futures team² and teams responsible for systems development³ greatly enhanced the generation of new ideas.

Definitions

There are several terms unique to this study which require definition to aid understanding. These terms are *Alternate Future*, *Named World*, *Driver*, *Dimensions*, *Strategic Planning Space*, and *Plausible History*.

Alternate Future: a logical, coherent, detailed, and internally consistent description of a plausible future operating environment.⁴ To be effective, these futures must contain several characteristics. They must capture key variables for the customer's organization, describe the full range of challenges and opportunities, be internally consistent, be named in a way which evokes the character of the world, and have a plausible history.⁵ Other terms used in this study synonymous with alternate futures are *alternative futures*, *scenarios*, or *future worlds*.

Since the future contains many possibilities, this study uses multiple futures to capture the full range of challenges important to air and space power. Envisioning alternate futures is a creative planning technique to anticipate future operating environments for a firm, organization, or nation. This is a necessary step in effective long-range planning which seeks to minimize the chances and consequences of strategic surprise.⁶ The six alternative futures contained herein are future worlds, each containing its own challenges and implications.

Named World: The name of an alternate future "carries a lot of freight"⁷—it should condense a detailed story into a few words. The name must provide a rich reference point that helps internalize the world's implications. A name like "Red Threat" or "Green Revolution" immediately conjures an image in one's mind of what such a world is like. An alternate future's name becomes a helpful form of lingua franca when planners and decision makers meet, enabling everyone to operate with a common understanding—if, for example, someone says, "Project X makes sense in Red Threat, but will not contribute in Green Revolution."

Driver: a factor determined to be an important contributor to change affecting the future.⁸ Drivers should be beyond the control of the customer, as independent as possible from each other, and relevant to the customer.⁹

Dimensions: the extreme values of a driver. Each driver is one-dimensional. For example, the American Worldview ranges from Domestic to Global. Domestic and Global are the extremes, and thus the dimensions, of American Worldview.¹⁰

Strategic Planning Space: a three-dimensional region defined by placing the three drivers on orthogonal axes. This space

bounds what the study participants believe to be all the relevant possible outcomes for the year 2025.¹¹

Plausible History: the significant events and milestones which mark how a future world evolved from the present. The history reflects trends and discontinuities that led to the alternate future.

A plausible history combines with the name of an alternate future to make a world believable by tying it to the present through a reasonable evolution of events and trends. Major events and milestones tell a world's story and flesh out the details necessary to understand the challenges facing the alternate future's inhabitants.¹²

The events shown in the chronology are not a prediction of what will happen, but must be logical in that they could occur and generate further actions and other nonlinear effects. These plausible histories are not specific forecasts of the future because there are so many possibilities, any specific forecast is guaranteed to be wrong. The real test of an alternate future is not whether one forecasts the future precisely but whether the customers change their behavior because they envision the future differently.¹³

Overview

This paper begins with a detailed description of the methodology used in developing the drivers. The methodology (chapter 2) details how the study participants identified the three drivers, created the strategic planning space, selected the worlds of interest, created the plausible histories, and developed the details of the worlds.

This paper then describes, in turn, the six worlds created for the **2025** study. Each of the alternate futures created for the **2025** study provides unique challenges and opportunities. *Gulliver's Travails* (chapter 3) is a world of rampant nationalism, state and nonstate terrorism, and fluid coalitions. The US is globally engaged to keep this chaos abroad, but America's ability to influence events is dispersed by the vast numbers of different actors. *Zaibatsu* (chapter 4) is a "company store" world where the sovereignty of the nation-state has been diminished by profit-seeking multinational corporations. *Digital Cacophony*

(chapter 5) is a world of almost unlimited technology. It promises great rewards and delivers unexpected disasters. *King Khan* (chapter 6) is a world dominated by a foreign superpower. The United States has become the "United Kingdom of the Twenty-first Century." *Halfs and Half-Naughts* (chapter 7) is a world in turmoil. The accelerating gap between wealthy, technologically advanced societies and the "have-nots" wreaks havoc on political and social structures. *2015 Crossroads* (chapter 8) is an interchange on the road to 2025. It may lead to almost any of the other futures depending on how the United States and others react to a strategic challenge. These chapters provide descriptions of possible futures. These are not descriptions of how the world *will* be, but how it *could* be. Within chapters three through eight, the paper specifically addresses the following:

a. *The Plausible History*: describes the major events from 1996 to the 2025 worlds.

b. *The Nature of Actors*: identifies the major groups or individuals who have the willingness and capability to affect others in the world. Their motives or agendas are discussed.

c. *The Nature of International Politics*: addresses the nature of international relations and alliances. The mechanisms of power are described.

d. *The Nature of US National Security Strategy*: outlines the national security strategy which might be employed by the United States in this world.

e. *Nature of Humanity*: discusses the nature of people and their interactions. This section describes the social structures bearing on these relations.

f. *Nature of Technology*: details the level and types of technological change.

g. *Nature of the Environment*: delineates the degree of environmental degradation and corresponding implications.

h. *Nature of the Defense Budget*: notionally assesses the amount of money spent on US national defense. Where necessary, tradeoffs between modernization and readiness are discussed.

i. *Capabilities*: outlines the capabilities most needed to accomplish the national military objectives in the world.

j. *Implications*: developed deductively, these seek to further illuminate the intrinsic nature of each world, describing aspects not otherwise apparent. In particular, the paper provides insights regarding the application, doctrine, nature, or utility of air and space power in the world.

k. *Summary*: reviews each world at a top level, summarizing its unique characteristics and nature.

After describing each of the six worlds, this paper draws some conclusions and recommendations (chapter 9) with respect to these diverse operating environments. Recommendations for further use of the study are also contained in this section.

Appendix A provides a discussion on the future of Air Force long-range planning. The appendix addresses why it is important to conduct long-range planning and what types of questions should be answered with planning. It also presents an architecture for institutionalizing long-range planning. Finally, the appendix compares and contrasts the Air University **2025** alternate futures with the future operating environments generated by the Air Staff's Long-Range Planning Office.

Appendix B provides an overview of some current trends, and compares these linear extrapolations with the realities found in the **2025** alternate futures. In some cases the correlations are nearly one-to-one. In other cases, the trends have diminished, or accelerated in a nonlinear fashion, due to the impact of the drivers. This appendix provides a baseline from which the reader can evaluate the impact of the drivers' interrelations in each world.

Appendix C contains a matrix of many other aspects of the six alternate futures. Additional information about the following subjects is provided in the matrix: world slogan, environment, resources, technology, politics, US economy and DOD budget, education, military, energy, ethnicity, actors, trade, international law, social services, orientation, average life expectancy, favorite sport or recreation, and health care.

Appendix D contains additional information about the future systems, concepts, and technologies potentially available, or useful, in each of the six alternate futures. These

tables can be thought of as “toolboxes” for each world. The tables list systems, concepts, and technologies described in other **2025** white papers. These “tools” are arranged according to their expected utility for military forces in general, space power, airpower, land power, and sea power. The tables provide a qualitative “first cut” at evaluating whether a certain system, concept, or technology would be useful or available in a particular world. The operational analysis monograph contains the detailed and final evaluation of the systems, concepts, and technologies developed by the study participants.

With this introduction in mind, this monograph will now chart the course the study participants traveled in developing the alternate futures of 2025.

Notes

1. Message, 231848Z Dec 1994, chief of staff of the Air Force to commanding general Air University.

2. See acknowledgments—the original team numbered more than 20 members. All but five members were eventually divided among the remaining 30 **2025** writing teams.

3. All study participants received a briefing on the original four worlds on 3 January 1996. After the briefing to the Executive Committee of the Air Force, the study's primary customers requested the creation of two new worlds. These were briefed to the study participants on 15 February 1996.

4. The basic definition comes from *Air University Spacecast 2020 Into the Future: The World of 2020 and Alternative Futures* (Maxwell AFB, Ala.: Air University Press, 1994), 3–4.

5. Col Joseph A. Engelbrecht, Jr., PhD, “**2025** Alternate Futures Development,” briefing to **2025** study participants, Air War College, Maxwell AFB, Ala., 11 October 1995; and *Air University Spacecast 2020*, 3–4.

6. Peter Schwartz, *The Art of the Long View* (New York: Doubleday, 1991), 117, 141–171, 209–212.

7. *Ibid.*, 210–211.

8. This definition builds on the analysis presented by Colonel Engelbrecht and contained in the *Spacecast 2020* monograph. Engelbrecht, briefing; and *Air University Spacecast 2020*, 5–6.

9. Charles W. Thomas of the Futures Group emphasizes the importance of the drivers' being appropriate to the specific planning challenge and beyond the customer's control. Thus, drivers related to the same planning problem may vary slightly as the customers change to “higher level” officials who influence facets of the problem. Charles W. Thomas, Futures Group, comments during a workshop on long-range planning, Washington, D.C., 12 December 1995.

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10. Engelbrecht, 6-9. This study further refined the *Spacecast 2020* process.

11. Ibid., 8-9.

12. Dr John Anderson's Horizon Mission Methodology for National Air and Space Administration scientific forecasting has made the same discovery of the importance of projecting oneself into the future and "backcasting" to the present. Dr John L. Anderson, "Horizon Mission Methodology," lecture to **2025** participants, Air War College, Maxwell AFB, Ala., 23 August 1995. Dr Peter Bishop, who leads the United States' only graduate studies program in future study, notes that the futures and the plausible histories have their greatest impact if described as a story that connects with decision makers and planners. Dr Peter C. Bishop, "Long-Term Forecasting," lecture to **2025** participants, Air War College, Maxwell AFB, Ala., 13 September 1995.

13. Because of the nature of the drivers, it is not possible for the customer to act in such a way as to change the future. One can act to prepare for a future that is foreseen to ensure that one is best prepared to live within it. For similar commentary see Schwartz, 214.

Chapter 2

Methodology

*If a man will begin with certainties, he shall end in doubts;
but if he will be content to begin with doubts, he shall end
in certainties.*

—Sir Francis Bacon
The Advancement of Learning

The Air Force is embarked on a mission to improve its long-range planning (see appendix A). An important aspect of that mission is to envision the future so the Air Force can position itself to provide the required capabilities. This chapter discusses how the Alternate Futures team derived visions of six alternate futures. To accomplish this, **2025** study participants analyzed current trends (see appendix B), studied the work and methods of respected futurists¹ and scientists,² and considered possible impacts of “wild cards”³ or surprises. This review provided a foundation from which to begin analyzing possible “drivers”—the factors which will drive major changes in the world over the next 30 years. The interactions of these drivers produced an infinite number of worlds; six were selected as the most interesting or stressful for the customer. Plausible histories and descriptions of unique features provided detail to these futures and linked them to today. This approach created viable futures which stepped beyond mere extrapolations of current trends. The steps of the alternate futures process are⁴ selecting the drivers, defining the drivers, creating the strategic planning space, naming and selecting worlds of interest, describing the “nature of” and features of each world, and developing plausible histories.

Metrics for Success

Good strategic planning meets three requirements. First, the alternate futures created should adequately stress the systems of interest.⁵ Second, the alternate futures must contain sufficient detail and richness to be useful for planning. Finally, the vision of the future should be broad enough to ensure the

entire range of challenges are adequately captured; in other words, ensure the customer is not surprised by the future.⁶

Selecting the Drivers

The first step in creating the alternate futures was identifying the drivers that would be most influential in shaping the future.⁷ Drivers are physical or virtual forces or vectors which are expected to be a significant cause of or contributor to change. A driver should also be beyond the strategic planner's (customer's) control—the customer's only viable option must be adaptation to the change produced by the driver.⁸ Correct driver selection was fundamental to creating alternate futures.

This process began with dividing the 225 study participants at the Air University (AU) into 14 seminars. Each seminar then used a combination of scientific and nonscientific methods to develop a list of potential drivers.⁹ The scientific methods involved analyzing various trends, conducting research on various topics, interviewing respected futurists and scientists, and completing affinity diagrams. The nonscientific methods involved creative thinking techniques¹⁰ such as brainstorming,¹¹ "exploring,"¹² and "artistry."¹³ All told, over 100 candidate drivers were generated by this process. One or two individuals were then nominated from each seminar to evaluate all of the potential drivers. These individuals comprised the **2025** Alternate Futures group.¹⁴

This group's initial task was to identify drivers that were relevant to the customer and would significantly impact the future. The group accomplished this task by using affinity diagrams to coalesce the initial list into a smaller number of drivers.¹⁵ A variety of quality concepts and brainstorming techniques narrowed the initial list to five major candidate drivers. These candidate drivers were the US worldview, the environment and level of resources, economic forces, technology issues including proliferation, and the nature of global power.

The group's goal was to consolidate these five candidate drivers into three drivers.¹⁶ For three months, the Alternate Futures group extensively analyzed trend data, conducted research, brainstormed, and discussed the merits of these drivers. The study group determined economic forces could be

expressed in a multifaceted driver which captures the essence of world power. The study group also concluded that the state of the environment and resources would be an important factor in the future, but not as relevant to air and space power as other drivers.¹⁷

Defining the Drivers

The Alternate Futures team consolidated the definitions and elements of the three remaining categories to describe and name the drivers for this study. Part of this description included naming the dimensions, or poles, for each driver. Dimensions provide the direction for a driver's force—the extreme variations in how the driver could shape the future. The drivers are American Worldview, Δ TeK, and World Power Grid.

American Worldview

This driver describes the US perspective of the world, which determines the willingness and capability of the US to take the lead in international affairs. It can be influenced by world events, domestic politics, fiscal health, and societal problems such as crime and drug abuse. Its dimensions are Domestic and Global. If the American Worldview is Domestic, the US will focus on internal problems rather than involving itself in world affairs. A Global worldview implies the US will seek a world leadership role.

Δ TeK

TeK was defined as the ability to employ technology. Δ TeK describes the differential in the rate of growth in technological proliferation and sophistication.¹⁸ Its dimensions are Constrained and Exponentialⁿ. In a world where Δ TeK is Constrained, technological advances occur at an evolutionary rate and few actors are able to exploit them. Exponentialⁿ Δ TeK results in a world where many actors can exploit revolutionary breakthroughs across multiple scientific disciplines. New technologies may become obsolete even before being fielded.

World Power Grid

This driver describes the generation, transmission, distribution, and control of political, military, economic, or informational power throughout the world. Its two dimensions are Concentrated and Dispersed. In a world where the power grid is Concentrated, there are few actors with the power and will to dominate others. A world with Dispersed power has thousands of actors (or even individuals) with the power and will to affect the rest of the world.

Creating the Strategic Planning Space

Placing the three drivers on the axes of a three-dimensional coordinate system creates the **2025** strategic planning space shown in figure 2-1.

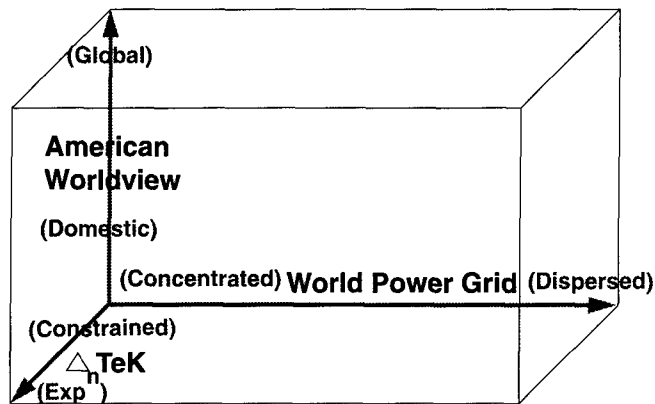


Figure 2-1. 2025 Alternate Futures Strategic Planning Space

The origin is the “low end” of all three drivers, with the tips of the axes denoted as the “high end” of each driver. One can use the strategic planning space to “place” a given alternate future for comparison to others. For example, a world with a Concentrated World Power Grid, Exponentialⁿ Δ TeK, and Global American Worldview would be pushed (by all three drivers) towards the upper left front corner of the strategic planning space.

The technique of creating the strategic planning space by using the extremes of the drivers guarantees the alternate futures generated will be challenging and will achieve the metric of preventing surprises. Drivers pushed to the extremes produce the discontinuities and nonlinear effects absent from most long-range planning efforts. The alternate futures process corrects these planning deficiencies. For a detailed discussion of current Air Force long-range planning and recommended improvements, see appendix A.

Naming and Selecting Worlds of Interest

Selecting the alternate futures of greatest interest to the customer began with picking worlds at the extremes of the strategic planning space. This technique meets the primary challenge—describing a set of futures covering the full range of challenges and opportunities for future US air and space forces. Pushing all drivers to the extremes resulted in eight different futures for consideration (table 1 and fig. 2-2). The worlds selected are highlighted in bold.

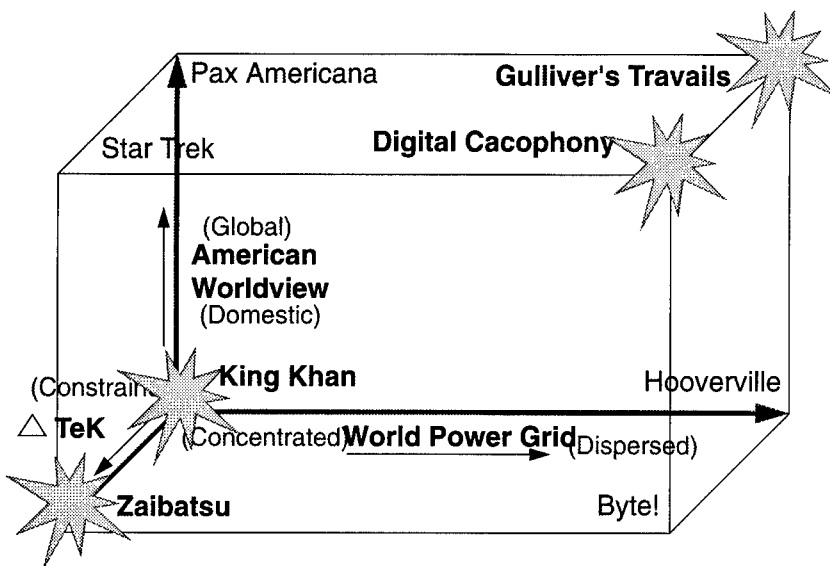


Figure 2-2. Strategic Planning Space with Named Worlds at Extremes

Table 1
Original 2025 Alternate Futures

World	American Worldview	Δ TeK	World Power Grid	Name
1	Global	Exponential ⁿ	Dispersed	<i>Digital Cacophony</i>
2	Global	Exponential ⁿ	Concentrated	<i>Star Trek</i>
3	Global	Constrained	Dispersed	<i>Gulliver's Travails</i>
4	Global	Constrained	Concentrated	<i>Pax Americana</i>
5	Domestic	Exponential ⁿ	Dispersed	<i>Byte!</i>
6	Domestic	Exponential ⁿ	Concentrated	<i>Zaibatsu</i>
7	Domestic	Constrained	Dispersed	<i>Hooverville</i>
8	Domestic	Constrained	Concentrated	<i>King Khan</i>

Members of the **2025** Alternate Futures group individually analyzed all of the alternate futures and named them to create an image of what each future would be like. Discussions of all submitted names for the futures produced a consensus on names which best captured the essence of each world.

Selecting the most "interesting" worlds, those most relevant to the customer, was the next step in the process. Development of too few futures increases the chance of a future "surprise"—an unanticipated future trend. Selection of too many futures runs the risk of distorting the customer's focus—differences begin to blur, and worlds lose their unique identities as a basis for meaningful decisions. Following Schwartz's advice,¹⁹ the team selected the four worlds which provided the most stressful planning challenges: *Gulliver's Travails*, *Zaibatsu*, *Digital Cacophony*, and *King Khan*.²⁰ Each face of the strategic planning space has two of these futures—a deliberate choice made to show that each driver was equally important in affecting the future. For example, selecting only one world, or no worlds, with a Domestic American worldview would reduce or eliminate any inclusion of this possibility in the **2025** concept development and operational analysis.

Describing the “Nature of” and Features

The next step was to add flavor, enriching the worlds by providing substance to the vision describing each world and simultaneously ensuring internal consistency. The group accomplished this step by brainstorming the “Nature of X” for each selected future, where “X” ranges from politics to types of vacations. Such questions as: “What is the nature of economic activity or international politics in this world?” “How do people get their news?” “What do they do for entertainment?” and “What are their biggest hopes and fears?” all provide valuable detail to each world. Envisioning characteristics such as the kind of vacations an average person takes often provided insights on what life would be like in each world.

For instance, in the Exponential¹ Δ TeK, individualistic and globally oriented world of *Digital Cacophony*, the average person dreams of taking a vacation cut off from this “wired world”—but fears being surprised by rapid, potentially catastrophic changes if he does so. This reveals something about the anxiety level inherent in *Digital Cacophony*. Several weeks of brainstorming, analysis, and discussion led to the production of a matrix outlining the different “nature of” features for each alternate future (see appendix C).

Developing Plausible Histories

Creating a plausible history—“backcasting” from the different futures back to 1996—was only possible after establishing a clear and detailed vision for each future. The Alternate Futures group divided up the worlds and brainstormed significant events or milestones, using data assembled on current trends where appropriate, which would lead to that future. For example, in *Gulliver’s Travails*, the American Worldview became more Global following a major terrorist attack on the US early in the twenty-first century. This event, along with increasing concern for the global environment, was postulated to help produce a consensus that the US should act vigorously to promote stability abroad (Global US Worldview) despite the frustration of a Dispersed World Power Grid.

Each world's draft history was then checked and compared with the others. Were the events plausible? Did they remain consistent with their alternate futures—in other words, did they support or contradict the drivers acting on their world? This discussion led to several events' being modified or shifted between worlds to ensure they properly fit the alternate futures being created.

Customer Feedback

The Alternate Futures team briefed the alternate futures to all **2025** students, faculty, the executive committee,²¹ and civilian advisors in January 1996, the midpoint of the study. The audiences thus included futurists, senior Air Force leadership, and the diverse backgrounds of the **2025** participants.²² This briefing contributed to the **2025** project's ongoing creative process. Questions and comments provided by all audiences were used to sharpen the focus of the alternate futures. Meanwhile, the **2025** writing groups used the futures to stimulate new concepts and technologies for development and began framing questions for how those concepts would be applied in the very different future operating environments.

Additional Futures

The **2025** charter was to provide “out of the box,” maverick thinking to cover the fullest possible range of outcomes and open up new perspectives for long-range planners to consider.²³ The four original alternate futures achieved this by pushing each of the drivers to extremes and exploring the results. Following the initial briefing, the Alternate Futures team was asked to develop two additional worlds.²⁴

The first new world, *Halfs and Half-Naughts*, originated conceptually from a future where the drivers were not at their extreme dimensions. The **2025** executive committee asked for a future world created by using the common themes threaded through the other worlds. *Halfs and Half-Naughts* demonstrates the flexibility of the alternate futures methodology. The drivers were set to their “midpoints,” producing a future which bears

some similarity to all of the original worlds yet stands on its own as a complete and consistent world.²⁵

The USAF chief of staff requested *2015 Crossroads* to serve as a bridge from today to 2025. This request created a world where the US is faced with some strategic decisions in 2015—in essence, a “fork in the road.” While *2015 Crossroads* begins with a future close to (but not identical to) *Gulliver’s Travails*, decisions by the US and other actors at the crossroads could send it straight towards *Gulliver’s Travails* or divert it towards a *Pax Americana* or *King Khan*-like future. This exercise also demonstrated that the Alternate Futures methodology can easily be applied to different time periods.

The next six chapters provide more detail on each alternate future—the histories, actors, politics, technology, and the nature of conflict in each world, as well as some of the military capabilities necessary to succeed in these operating environments. The final chapter closes with some conclusions and recommendations for future use of this product, both within and beyond the **2025** study.

Notes

1. Several futurists briefed the **2025** participants. Among these were Dr John Anderson, Dr Peter Bishop, Mr Carl Builder, Dr (Col) Joseph Engelbrecht, Dr Grant Hammond, Dr Armin Ludwig, Ms Christine MacNulty, Mr Gary Sycalik, Dr David Sorenson, Dr George Stein, Col Richard Szafranski, and Mr Alvin Toffler. Additional insights on creating futures were provided by Joe Haldemann (writer), Robert Justman (television producer), and Ed Neumeier (screen writer).

2. Other scientists who briefed the **2025** participants included Dr Arnold A. Barnes, Dr Paul J. Berenson, Dr Peter F. Bytherow, Dr Gregory H. Canavan, Dr Stephen E. Cross, Dr (Maj) Gregg Gunsch, Dr Charles B. Hogge, Dr Robert L. Jeanne, Dr Gilbert G. Kuperman, Dr James T. Kavich, Dr Martin Libicki, Dr Gene McCall, Dr Dennis Meadows, Dr Gregory Parnell, Dr Stephen Rogers, Col Pete Worden, and Dr Eli Zimet.

3. Wild cards are revolutionary events with a low probability of occurrence but a very high impact. Although some wild cards (like a major asteroid impact) are so catastrophic that military planning becomes irrelevant, it is necessary to raise the possibility that different wild cards can occur and provide a framework from which to assess evolving events. Furthermore, the inclusion of wild cards provides the discontinuous events that are not predictable via simple extrapolations of current trends. See John L. Petersen, *The Road to 2015: Profiles of the Future* (Corte Madera, Calif.:

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Waite Group Press, 1994), 287–337; and Gary Sycalik, “Wildcards,” briefing to **2025** participants, Air War College, Maxwell AFB, Ala., 6 September 1995.

4. Prior to the **2025** project, no one had attempted to define and describe how to create alternate futures sufficiently to teach the process to a large group. Based on *Spacecast 2020* experience, the **2025** project leaders decided that the methodology was so important to preparing officers for studying the future that the process needed to be taught to all **2025** participants. To accomplish this, the research and study directors defined the terms and steps of the process, then created a curriculum of presentations and exercises that enabled teams of participants to help create alternate futures. This approach resulted in the first set of curriculum materials for teaching the process and several hundred trained futurists. Twenty-four volunteers continued the process to create the futures described in this work.

5. The systems of interest in this study use the concepts and technologies described in the other **2025** white papers.

6. Peter C. Bishop, “Long-Term Forecasting,” briefing to **2025** participants, Air War College, Maxwell AFB, Ala., 13 September 1995.

7. Peter Schwartz, *The Art of the Long View* (New York: Currency Doubleday, 1991), 106. Schwartz refers to drivers as “driving forces.”

8. *Ibid.*, 113.

9. Dr Abby Gray of the Air Command and Staff College faculty has expressed concern regarding the “reproducibility” of the drivers identified by the Alternate Futures group. The drivers were identified by systematically using the Alternate Futures process presented to the **2025** participants by Col Joseph A. Engelbrecht, Jr., PhD, the **2025** research director. Although this process does not guarantee identification of a unique set of drivers, the process does heuristically generate a set of drivers accepted by the decision maker as being important to the organization and satisfying all the requirements for drivers. The Alternate Futures team recognizes the combination of art and science required to envision the future.

10. Similar techniques were used in *Spacecast 2020*—see *Air University Spacecast 2020 Into the Future: The World of 2020 and Alternate Futures* (Maxwell AFB, Ala.: Air University Press, 1994), 4.

11. For specific brainstorming techniques see Susan Holmes and Judy Ballance, *The Quality Approach*, Second Edition (Maxwell AFB, Ala.: Air Force Quality Institute, 1993). See also John P. Geis II, *Total Quality Management*, Squadron Officer School Textbook, Maxwell AFB, Ala., 1995.

12. For a complete description of how to “explore” see Roger von Oech, *A Kick in the Seat of the Pants* (New York: Harper and Row Publishers, 1986), 23–54.

13. For a complete description of “artistry” see Oech, 55–88.

14. The membership of this group consisted of those named in the acknowledgments and the named authors of this paper.

15. Holmes, 33–35.

16. Narrowing the number of drivers is helpful in three ways. First, it forces concentration down to those items most important to the customer. Second, reducing the number of drivers forces one to reach past several trends to find the unifying themes behind them, lending additional insights into the future. Third, three drivers are easy to display graphically, which makes the strategic planning space easier to comprehend.

17. Environmental and resource factors were captured in the other drivers or their interactions. For instance, proliferating Δ TeK can produce technologies that mitigate environmental damage while simultaneously unleashing unexpected effects. On the other hand, the World Power Grid can be influenced by the control of scarce resources.

18. Charles Thomas of the Futures Group, who (along with Joseph Engelbrecht) developed the first alternate futures for US security forecasting in the *USAF Innovation Study*, cautions against using technology itself as a driver. While it previously was used frequently by his firm, Thomas has found that most firms use technology as an instrument to adapt to a changing environment. As an external reviewer for **2025**, however, Thomas endorsed the more complex notion of Δ TeK as a driver which captures growth, proliferation, and leverage of technology. This richer overview of technologies' effects on society is a driving force beyond the control of planners and decision makers. Interview, 14 February 1996.

19. Schwartz, 233.

20. The other futures had interesting features, but were considered to be less stressful operating environments. *Star Trek* implies a World Power Grid which has coalesced in a single world culture and society, with high technology ameliorating many of the world's physical problems. A nice future to live in, but not a stressful operating environment for the military. *Gulliver's Travails* is more challenging than *Pax Americana*, where the US has the will and ability to keep world order. *Byte!* produced a world of small, high-tech "virtual villages" which more or less stay separate from each other. The team selected *Zaibatsu* to showcase working within and around multinational corporations as the de facto successor to nation-states. *King Khan* provided all the problems of *Hooverville*, with the presence of a dominant foreign superpower as an additional challenge.

21. The **2025** executive committee included the vice commanders of all USAF major commands (MAJCOM), all of whom were major or lieutenant generals heavily involved in conducting day-to-day military operations and making key budgetary decisions for their commands.

22. Briefings were also presented to many audiences outside of the **2025** project between January and April 1996, providing additional feedback from diverse perspectives. The briefing schedule for **2025** included the following: **2025** students (3 January 1996), executive committee (10 January 1996), National Reconnaissance Office (22 January 1996), Eighth Quadrennial Review of Military Compensation (22 January 1996), The Honorable Newt Gingrich (10 February 1996), Gen Ron Fogleman, USAF chief of staff (13 February 1996), Connections Wargaming Conference (7 March 1996), VAdm

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Arthur Cebrowski, JCS J-6 (7 March 1996), USAF Academy faculty members (13 March 1996), and participants of the Education in the Information Age Conference (18 April 1996).

23. Verbal conversation between Gen Ron Fogleman, Air Force chief of staff, and Lt Gen Jay Kelley, Air University commander.

24. The Alternate Futures team includes the authors of this paper. Other members of the larger Alternate Futures group began working on other white paper research teams following the 3 January 1996 briefing to all **2025** participants.

25. Expert futurists, including those who reviewed the **2025** alternate futures, cautioned against providing a "center of the box" world that many could misinterpret as a "most likely future." Schwartz, 233, specifically warned that viewing any given scenario as "most likely" tends to be viewed by customers as a single-point forecast, losing all of the advantages of using multiple futures.

Chapter 3

Gulliver's Travails



Gulliver's Travails is a world of rampant nationalism, state- and nonstate-sponsored terrorism, and fluid coalitions.¹ Most US citizens consider their nation to be the world's policeman . . . fireman, physician, social worker, financier, mailman, and bartender. It is much like being a traffic cop on an incendiary New York City Friday afternoon when the traffic lights stop working. Just when everyone foresees the illusory weekend escape from the rat race, they instead must compete to relax. A zero-sum calculus pervades much of the globe, and random firefights occur in a world where everyone is armed and many are envious.

This is an age in which agrarian and industrial civilizations often dominate the stage with unruly behavior, threatening to topple more "advanced" states when "primitive" conflicts create problems that spill across borders. Though the reasons for the conflicts may appear primitive, the weapons used are often modern.² Furthermore, newly anointed leaders are clever enough to realize refugees pose a threat to the stability of their

(Note: All graphics in this volume were created by the authors or used with permission from Microsoft Clipart Gallery®, Corel Gallery®, or Microsoft PowerPoint clipart with courtesy from Microsoft Corp.)

regime, be it an autocracy, a people's republic, or an economic enclave. Those in power assume, usually correctly, that the displaced will seek to return to their homes, or at the least to gain revenge.³ Consequently, to ensure their new state's security, governments seek some means for controlling the passions of those who might oppose them. In some cases, internal repression and external terrorism are the mechanisms chosen.⁴

Traditionally the United States could ignore some of these activities, but as the world has gotten smaller, the problems of terrorism are no longer confined overseas. Small states or groups may seek to either spur or deter US action in pursuit of their own agendas. The problem is there are too many actors, all clamoring for attention, frequently in direct opposition to one another. Addressing these claimants' issues is vital to the US because groups that are neither controlled nor appeased may export terrorism to America.

Nationalism lurks everywhere, usually asserting itself along ethnic, economic, religious, cultural, or racial schisms.⁵ In many areas, a man who is not one's brother is one's enemy. States which secede from within existing borders are themselves subject to civil wars, and states propagate as ever more groups seek self-determination. Territory is important in this world, because the emergent groups need land to form states. Because land matters, border disputes continue long after these tenuous states initially form.⁶ The violent, nationalistic conflicts concomitantly displace millions of people. Refugees stream across borders seeking food, shelter, and security, but their presence often sparks reactionary nationalistic movements in the "invaded" country.⁷

America, though without peer, finds its forces dispersed around the world, trying to answer all the alarms. As shown in figure 3-1, the American Worldview is Global; the United States is heavily involved worldwide in order to hold threats at arm's length. The World Power Grid is characterized as Dispersed. New actors are constantly appearing, alliances rapidly shift, and small actors can produce disproportionate effects. Δ TeK is Constrained because technological changes are occurring at an evolutionary rate, and not everyone benefits equally. The US government has not emphasized the

funding of basic research and development (R&D), relying instead on commercial developments. This R&D strategy is repeated around the world, so the United States has maintained a military edge in many dual-use critical technologies, particularly those related to operations in space.

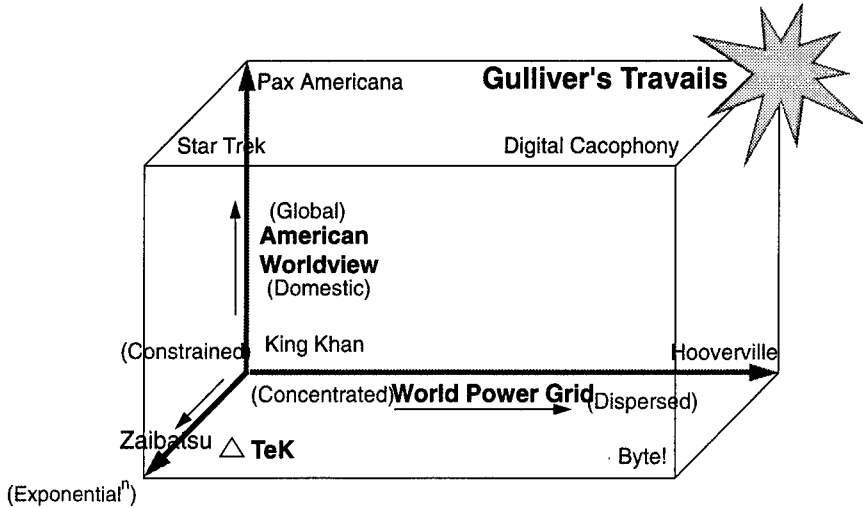


Figure 3-1. Strategic Planning Space for *Gulliver's Travails*

Plausible History

Gulliver's Travails is a world experiencing an explosion in the number of territories claiming statehood, as depicted in figure 3-2. The late twentieth century dismantling of the Soviet Union inaugurated a trend, as various groups sought to assert their national identity. States such as China and many African states continued to break apart, sometimes generating "micronations" that lacked the population or resources to defend their borders.⁸ In 2006, China fragmented along economic cleavages that had developed as industrialization and commercialization created distinctly different regions of financial development.⁹ Though Taiwan, Shanghai, and the other advanced Chinese states continue to espouse a "one China" philosophy, the current reality is that these regions cooperate where possible and compete when necessary.¹⁰

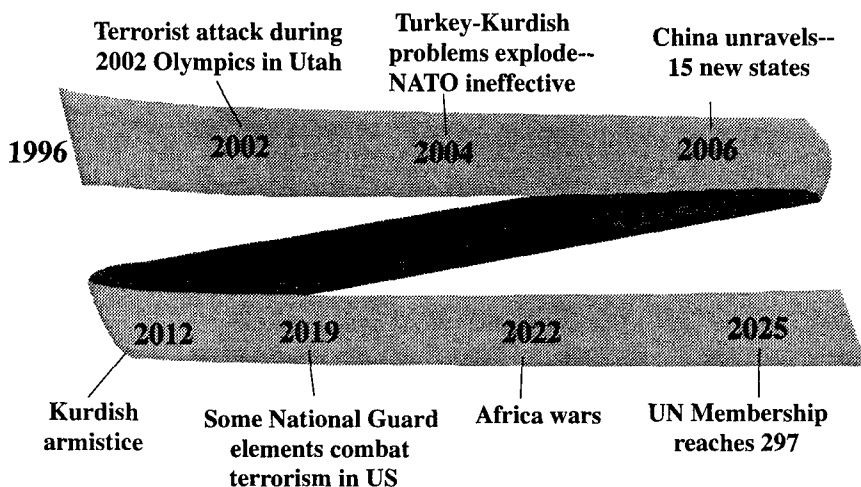


Figure 3-2. Plausible History for *Gulliver's Travails*

The constant formation of new states generated two primary threats. The first threat is state- and nonstate-sponsored terrorism. States use terror to control internal dissent and to influence nations with whom they cannot otherwise directly compete. Nonstate actors use terrorism to attack the legitimacy of governments they disagree with and to discourage other groups from supporting policies unfavorable to the terrorists.

The first large-scale terrorist incident on American soil was the biological attack launched at the 2002 Olympics in Utah, resulting in over a million American casualties, including a quarter-million dead.¹¹ Though a link to the Dugway Proving Ground was originally suspected, foreign terrorists were later proven responsible.¹² This incident sparked civil demands that authorities use all appropriate national instruments to deter and prevent terrorist acts within US borders. One step, taken in 2019, was to dedicate the training of specific National Guard units to antiterrorism efforts inside US borders.¹³ Threats of terrorism, at home and abroad, continue to drive national security initiatives.

The second major threat is ethnic- and nationalistic-inspired border disputes such as the Turko-Kurdish problem which

flared up in 2004 (see map at fig. 3-3).¹⁴ Power continued to disperse in the world when NATO proved ineffective in resolving the Turko-Kurdish conflict. NATO had sufficient military resources, but the alliance was unable to muster the collective will to contain the conflict before it spilled across borders into Iraq, Iran, Syria, Georgia, Azerbaijan, and Kazakhstan, putting over 340 million people at risk.¹⁵



Figure 3-3. Map of Turko-Kurdish Conflict Region

As the conflict continued without foreign intervention, chemical and biological weapons were used on the battlefield. Undeterred by world opinion, the use of these weapons threatened to become standard practice by 2011. At this point, a loosely linked United States-led coalition, including Russia, stepped in to announce that further use of these weapons would be met by severe reprisals. Though the conflict continued, no further chemical or biological incidents occurred, as the combatants proved reluctant to test the resolve of the coalition. The coalition was able to concentrate

on containment until the war-weary states signed an armistice in 2012. However, a critical threshold had been passed, and in 2025 the actual or threatened use of weapons of mass destruction (WMD) is standard in many conflicts. Only the nuclear threshold has not been crossed, due to the relatively slow spread of nuclear weapons technology and the apparent unwillingness of combatants to use nuclear devices. Some terrorist organizations have claimed to possess primitive nuclear devices, though they have not detonated one.

The latest round of African wars began in 2022, continuing to redraw the map lines created during the colonial era.¹⁶ As a consequence of these and similar conflicts, the resources of noncombatant nations around the world, particularly those states along the Mediterranean, are strained by mass migrations of refugees.¹⁷ Along with the problem of providing food and shelter for these refugees, the refugee camp conditions often spur the spread of diseases.¹⁸

The end result of all these economic restructurings, civil wars, wars of national liberation, wars of ethnic identification, and scenes of general xenophobic disorder is an unstable world, with threats from increasing numbers of actors in all quarters. Reflecting the growth in the number of actors, UN membership stands at 297.¹⁹

The Nature of Actors

The fates of three groups dominate the stage in *Gulliver's Travails*: terrorists, both state and nonstate; international organizations; and the United States. Though the European states and Japan remain key economic players in the world, domestic interests and constrained Δ TeK have hindered their economic growth. Both areas look to the United States for leadership in constraining terrorists, addressing worldwide refugee flows, and ensuring equitable access to resources. Both Russia and China have fractured along internal schisms and are not currently major global players.

Terrorism increases worldwide as relatively weak states seek to assert sovereignty, particularly with respect to the policies of the most visible world actor, the United States. Meanwhile, nonstate terrorists also commit heinous acts in the name of

establishing their legitimacy, or attacking the legitimacy of a government whose policies they disagree with. Many suspect some of these international groups exist solely as extortion rings, accepting blackmail or ransom payments in return for releasing hostages to fortune.

International organizations have experienced mixed successes and failures in the unstable international environment. UN conflict resolution mechanisms and resources are saturated by the influx of new members, many of whom squabble with each other. The UN's credibility declines further when it cannot constrain state-sponsored or antistate terrorism.²⁰

Temporary coalitions have become the order of the day as states operate from crisis to crisis. Some international organizations, such as the Red Cross, remain on the scene, often providing vital resources to coalitions combating famine and disease. These groups, however, are loath to cooperate with the United States on humanitarian missions lest they be accused of complicity with the Americans. The risk of becoming terrorist targets outweighs the value of access to American logistics.

Anxious to reduce the sources of local, regional, and international turmoil, many nations and states look to the United States for help in restoring stability and combating both state and nonstate terrorists, who have occasionally threatened to use WMD. The continuing terrorist threat guarantees domestic support for the US decision to assume a worldwide leadership role in trying to deal with global problems. Ever-increasing political, economic, and military resources are expended trying to control interstate conflicts, combat terrorism, and conduct other military operations.

The Nature of International Politics

The United States is, in effect, not a superpower because it cannot dictate its will to an increasingly uncooperative world. Relative to any single nation, however, the United States is an economic and military giant. US membership in alliances has been highly sought, particularly after this country successfully brokered an armistice in the Turko-Kurdish Wars. Some

coalitions have formed to oppose US interests, but these were usually unstable due to their limited shared aims.

The Nature of US National Security Strategy

The strategic challenge in this world is to defend against WMD-equipped terrorists while maintaining a high operations tempo in other mission areas. Much of the high operations tempo is caused by numerous overseas involvements responding to constant border disputes brought on by rampant nationalism. These border disputes create massive refugee flows and generate taxing humanitarian and peace enforcement operations.

Therefore, the two principal dangers the military must address are regional instability and the transnational danger of terrorism.²¹ As a consequence, the primary national security objective is promoting stability, thereby supporting American partners and deterring aggressors who might export terrorism to America. To support this objective a strategy evolved for rapidly projecting power and civil-military operations capabilities, in combination or separately, as necessary. Projection is the mechanism of choice because it is dangerous to maintain concentrations of forces overseas, and most states will not accept permanent US military bases. Antigovernment and foreign terrorists have attacked governments that made basing concessions to the US.

The Nature of Humanity

An uneasiness regarding outsiders, akin to xenophobia, is a characteristic trait of neighborhoods in *Gulliver's Travails*. So is a fear of gathering in large groups, as many remember the terrorist attack at the 2002 Olympics. The threat of terrorist activity causes groups to trust only those they have known for years, preferably decades.

As a paradoxical consequence, American military members are both admired and mistrusted. They are admired because they enhance stability and safety, but they are mistrusted because permanent changes of station and temporary duty assignments prevent military members from forming close links in the communities where they serve. As a result of the

general mistrust of strangers, families have become more important in this world.

The Nature of Technology

In the world of *Gulliver's Travails*, technology has grown at an evolutionary rate, perhaps due in part to the regulatory structure of government programs around the world. Others argue that disruptions in the world body politic have hindered Δ TeK, as governments concentrate on terrorist and border threats rather than supporting basic R&D. Evolutionary growth is the most important aspect of technology in *Gulliver's Travails*, but important developments have begun in at least one area, the exploitation of space.

In America, government funding of R&D, particularly basic research, generally lagged as a result of allocating funds to export military power in a quest to sustain internal security. However, America was able to maintain its lead in certain technologies because of the Constrained nature of Δ TeK, although that lead is eroding.

Elsewhere, other nations recognized that an indigenous computer and information industry was crucial to a state's long-term vitality, though the policies implemented were often counterproductive.²² For instance, states placed high tariffs on computer imports in attempts to protect nascent industries, but this resulted in reduced access to advances in the state of the art. Another regulatory miscue was seen in some locations where information was taxed to provide revenues, unintentionally stifling initiatives to develop the new industries so desperately sought. Attempts to contain terrorism led many nations to establish controls on the export of dual-use technologies, unintentionally acting as an additional brake on technology development. One readily evident consequence of poorly managed policies and economic competition between states was an information superhighway frequently overloaded with information, debilitated by computer viruses, and slowed by competing architectures.

Developments in space did not labor under similar quantities of regulation. The increased importance of transmitting information led the commercial sector to invest heavily in

space communications. (In return for releasing bandwidth to the military, commercial firms now are financially compensated and are granted relief from antimonopoly laws to allow participation in government-sponsored consortiums to improve satellite defensive systems.) Some projects, however, required resources greater than venture capitalists were willing to risk. For example, four international space stations were developed under the aegis of the US government and placed in orbit by 2015.²³ Groups that cooperated in this space infrastructure project included both traditionally friendly nations, such as the United Kingdom, and multinational corporations seeking competitive opportunities in zero-g technologies. Spin-off technologies from this effort continue to enhance US military capabilities.

The American military edge garnered by investments in space has not gone unnoticed by potential adversaries. Some states have deployed antisatellite systems (ASAT) to counter the force-multiplier effect of satellite coverage, and in response the United States has developed some satellite defensive systems. However, there remains little defense against inexpensive, nuclear-tipped ASATs.²⁴

The Nature of the Environment

The United States has led efforts to coordinate actions to mitigate global warming and environmental degradation.²⁵ Efforts to mitigate environmental damage are an issue the advanced states attempt to address in new states and inside their own borders. A general concern regarding the ecosphere allows the environment in *Gulliver's Travails* to be characterized as "green."²⁶

Coordinated actions include providing aid to newly industrializing countries, usually in the form of technological know-how. This aid is considered mutually beneficial, providing new states with infrastructure investments and advanced nations with a more stable international political structure. All nations are presumed to benefit from efforts to minimize stress on the environment, particularly the attempt to control the trend in global warming.²⁷

Many advanced countries used taxes to keep the price of fossil fuels artificially high, thereby restraining internal energy consumption. Environmentally friendly government policies created a market for alternate forms of energy including solar, wind, geothermal, oceanic, and biomass.²⁸ Countries with large standing militaries used these forces as testbeds for many alternate energy programs, in addition to curtailing some training activities and closing some training ranges.²⁹ In the United States, the military invested heavily in alternate forms of energy, including solar heat for buildings and hydrogen fuel for aerospace planes. In addition, the military closed energy-inefficient bases and consolidated some geographically proximate facilities.³⁰

The Nature of the Defense Budget

During three decades of economic growth averaging 1.8 percent,³¹ the budget for the Department of Defense (DOD) sustained a slight decrease in constant year 1995 dollars (see fig. 3-4). To maintain readiness in the face of this decrease, DOD cut support for R&D and modernization programs. As a result, the military industrial base eroded and second- and third-tier contractors disappeared, while major suppliers consolidated horizontally.³² Had it not been for dual-use, off-the-shelf commercial technologies, the US military would already have had to make deeper cuts in readiness, force structure, and modernization programs. These tradeoff decisions were delayed after 2015 when DOD budgets began to increase at a rate approaching 2 percent real growth per year. This funding reflected the desire of the body politic to secure American borders by operating abroad. In 2025, the DOD budget represents just over 2.3 percent of gross domestic product (GDP).

The 2025 DOD budget is approximately \$270 billion in 1995 dollars. Though this amount is essentially the same as in 1995, increased overseas commitments and high personnel costs strain the defense budget. Host nation support is unable to significantly defray DOD overseas expenditures because the US's driving motivation is to reduce the level of conflict around the world and thereby reduce the export of terrorism to

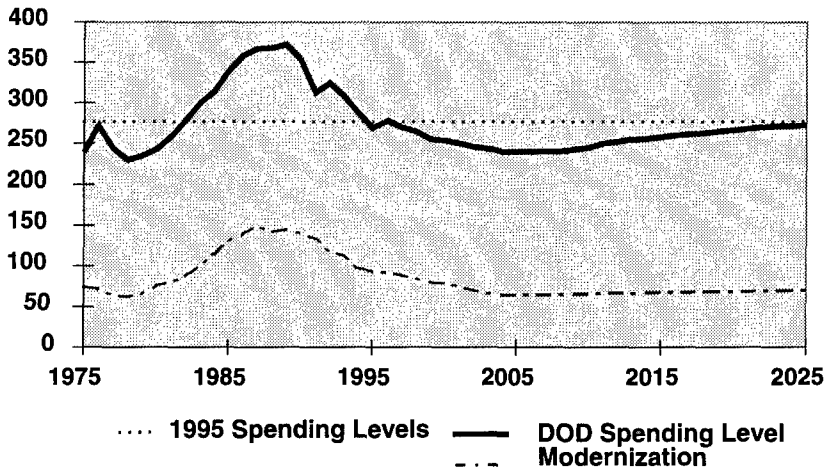


Figure 3-4. DOD Budget (Constant FY95 \$B) in *Gulliver's Travails*

America. Other nations realize this and are able to play on these fears to bargain for US financial concessions, such as aid packages, debt rescheduling, and other economic incentives.

Capabilities

Despite limited DOD budgets the military must be able to detect incipient crises and respond quickly once a situation is judged vital to US interests, acting before the crisis escalates unacceptably. The military must develop the equipment and skills to operate along the spectrum from peace operations to terrorist abatement to nuclear deterrence. Furthermore, maintaining a high operations tempo is a by-product of worldwide political instability that is exacerbated by the proliferation of nations.

The onset and monitoring of crises are primarily achieved through a combination of worldwide satellite coverage (both military and commercial networks) and human intelligence (HUMINT). Though Δ TeK is generally Constrained, significant US commercial and government investments in space allow the DOD to exploit the extant communications and sensor infrastructure. The large bandwidth, global coverage, and

redundancy of the orbital systems effectively provide the military with worldwide intelligence coverage, on demand, all the time.

HUMINT often provides more warning time than satellite coverage, and also provides a human element regarding the motivations of the actors involved in precipitating a crisis. Furthermore, HUMINT may pinpoint the key actors responsible for the onset of a crisis, or provide details of planned actions. The combination of HUMINT and satellite-based intelligence provides the US government with the information leverage to forestall actions unfavorable to American interests. The US can generally secure cooperation from other countries for combined operations or gain acquiescence for unilateral US operations. The satellite systems then ensure that any necessary forces are kept cognizant of threats in the area of responsibility.

Once a crisis action area has been identified, assets must be transferred rapidly to the scene. In the majority of responses, light mobile ground forces are used to resolve the situation. In this alternate future, C-17 Globemasters and commercial air provide that rapid response.³³ Rapid intervention sometimes allows forces to be withdrawn in days or weeks; thus long-term logistics support is usually not required, sparing the US considerable expense. In situations requiring operations enduring longer than three weeks, roll-on/roll-off (RO/RO), container ships, and afloat prepositioned supplies are available to meet cargo requirements.³⁴

Minimizing US forces' footprint is crucial so that personnel and equipment do not provide easy targets for groups using either conventional weapons or weapons of mass destruction. Whether intervening in a border dispute, supporting the legitimacy of a government through civil-military operations, or conducting counterterrorist actions, the military must remain prepared to operate in biological and chemical environments. That includes the detection and defusion of these WMD. American forces also deter and counter threats to cross the nuclear threshold, to include fielding a theater ballistic missile defense system where intelligence assets indicate a threat.³⁵ To minimize threats to personnel, the military relies on survivable platforms with a rapid-response,

precision strike capability, and on advanced unmanned aerial vehicles to perform missions from reconnaissance to air refueling.³⁶

The variety of conflicts and missions presents a potential overcommitment dilemma for US forces. Overcommitment is particularly critical for the Marine Corps, the most frequently deployed service. The combination of good intelligence sources, a rapid deployment and redeployment capability, and precision strike capability address the equipment side of the equation. Personnel programs, such as weekly satellite video teleconferences, partially redress human issues such as extended family separations.

Implications

The proliferation of nations has yielded a Dispersed World Power Grid, a world wherein the US must rapidly detect, and react to, incipient crises before events deteriorate into a situation with negative consequences for America. As a result, DOD vitality depends on conducting coalition operations, adjusting to the operations tempo, and exploiting dual-use technologies.

Coalition operations dominate the military working environment. Consequently, professional military education emphasizes international affairs, diplomacy, and peacekeeping to the exclusion of nearly all else. Such skills are critical because most nations deny America basing rights. In fact, diplomatic passage of forces may threaten the success of some operational plans. Accordingly, combined task force commanders (CTFC) are sometimes dual-hatted as special envoys to provide them with the tools necessary to accomplish their missions. The actual mechanisms of military-to-military interactions also merit significant CTFC attention. The issue of intelligence crossflow is particularly volatile due to the fluid nature of coalitions; states may cooperate one day and compete the next.³⁷ Interoperability issues are generally resolved through commercial communications systems, particularly space-based systems.³⁸ To minimize conflicts between coalition partners, bilingualism is encouraged among US service members, and those service members are tracked

using special identifiers; some are placed on a special leadership track.³⁹

DOD has made adjustments to force structures and doctrine in order to sustain the high operations tempo with a limited budget. The tempo has adversely impacted training and readiness. In fact, adjustment factors to the "C" rating were developed that allow units to appear more ready than they really are, if the units have been deployed for more than 230 days in the past year.⁴⁰ Meanwhile, the Marine Corps has increased in size because of the emphasis on light, rapid-reaction forces, while the Navy is about the same size as it was in 2010.⁴¹ Finally, the breadth of missions ensures reliance on reserves and civilian contractors, so CINCs were delegated greater authority to selectively call up Reserve and Guard forces.

Dual-use technologies are key to the success of the American military. Several policy decisions have contributed to the current ability of the DOD to maintain an adequate industrial base. First, military standards and specifications were eliminated. Second, multiyear procurements were adopted. Third, military science and technology relies on spin-offs of civilian R&D.⁴²

Summary

In *Gulliver's Travails* the US attempts to act as a global policeman, but finds its power dissipated by the sheer number of actors. State- and nonstate-sponsored terrorists present one challenge, border conflicts another, and refugees a third. Limited defense budgets and the high operations tempo threaten the military's ability to continue successfully performing a variety of missions that deter activities counter to American interests. To date, evolutionary developments in dual-use technologies and adjustments in the concept of operations have provided a continued military edge, but this edge could evaporate quickly. In many ways, *Gulliver's Travails* is similar to the world of 1996.

Notes

1. A former head of the French intelligence service believes that the cold war was WW III, and that WW IV will be a terrorist war. Winn Schwartau, *Information Warfare* (New York: Thunder's Mouth Press, 1994), 37.

2. Similar to the Iran-Iraq war, a 1917-type war fought in the 1980s using 1970s weapons. A textbook edited by Drs Magyar and Danopoulos provides a useful summary of the Iran-Iraq conflict that ended in 1988, including explanations of how outside forces contributed to prolonging a war that dragged on for eight years. M. A. Shahriar Shirkhani and Constantine P. Danopoulos, "Iran-Iraq: Protracted Conflict, Prolonged War," in Dr Karl P. Magyar et al., eds., *Prolonged Wars* (Maxwell AFB, Ala.: Air University Press, August 1994), 17-40.

3. At times the US must fear acts of revenge as a consequence of efforts to control terrorism in *Gulliver's Travails*. This state of affairs mirrors that seen in Bosnia in January of 1996. At that time American troops were placed in a heightened state of alert, following reported Muslim threats in response to the sentencing of Sheik Omar Abdel Rahman by an American court. The sheikh was convicted of terrorism plot charges. Chris Hedges, "Fearing Attack, US Is Tightening Bosnia Security," *The New York Times*, 24 January 1996.

4. Henry Kissinger points out an "iron law of revolutions: the more extensive the eradication of existing authority, the more its successors must rely on naked power to establish themselves." *Gulliver's Travails* displays evidence of that violence as groups war to claim their rights. Henry Kissinger, *Diplomacy* (New York: Touchstone Books, Simon and Schuster, 1994), 655.

5. Karl P. Magyar asserts that most future conflicts will be economic in nature. Dr Karl P. Magyar, faculty of Air Command and Staff College, Air University, Maxwell AFB, Ala., interview with one of the authors, 9 April 1996.

6. Dr Magyar notes that many of these fragmented states will enter a stage where they seek to form local or regional blocs in order to enhance their economic viability. Some of these efforts will be peaceful, and some will involve wars of consolidation or expansion.

7. Paul Kennedy believes that millions will migrate from the less-developed nations just to enjoy the crumbs that fall off the table in the developed countries. Furthermore, citizens of the developed nations will only constitute 10 percent of the world population, so must consider the repercussions of any actions taken against migration. Art Levine, "The Future Is Bleak," *Esquire*, October 1993, 153; and Paul Kennedy, *Preparing for the Twenty-First Century* (New York: Random House, 1993), 46.

8. Jennings suggests that even Italy will break into two parts, though to the benefit of both north and south. Lane Jennings, "The World in 2020: Power, Culture, and Prosperity," *The Futurist*, September-October 1995, 60; and Schwartau, 30. The Institute for National Strategic Studies suggests that the Middle East will continue to fragment as a result of the removal of cold war constraints. The same study notes that disorder and conflict in

sub-Saharan Africa are "becoming more intractable," and the level of civil strife and disorder is accelerating. These assessments can be used to infer a worldwide trend that will not abate until the advent of a new polarization or some other stabilizing moment. *Strategic Assessment 1995*, Institute for National Strategic Studies (Washington, D.C.: US Government Printing Office, 1995). Secretary of State Warren Christopher warned of a world of 5,000 states unless ethnic groups can learn to live together. The deputy prime minister of Singapore, George Yao, suggests that the future of China may lie in hundreds of "Singapore-like city-states." Alvin and Heidi Toffler, *War and Anti-War* (New York: Warner Books, 1993), 288.

9. Fissures in the Chinese body politic are being created "by uneven economic growth in various areas." The Chinese government is attempting to address these issues, but could conceivably fail, as is asserted in this world. *Strategic Assessment 1995*, 25. Dr Magyar has expressed a dissenting opinion regarding the stability of China. He asserts that the majority of analysts believe China will not come apart. In an effort to avoid surprise, this world considers the challenges created by a China which unravels. Magyar, interview.

10. The "one China" philosophy originally was developed in 1949 after the Communists gained control of the mainland and Chiang Kai-shek's Kuo Min Tang forces retreated to the island of Formosa (Taiwan). Patrick E. Tyler, "As China Threatens Taiwan, It Makes Sure US Listens," *The New York Times*, 24 January 1996; Eric R. Wolf, *Peasant Wars of the Twentieth Century* (New York: Harper & Row, 1975), 103-155.

11. Salt Lake City, Utah, has been chosen as the site of the 2002 Winter Olympics.

12. In the movie *Outbreak*, the "Motaba" virus is discovered and recreated at the Dugway Proving Ground as a biological weapon. The plot of the movie has the virus escaping from Zaire and infecting a small town in California where hundreds of people die. The movie is based on the book *Hot Zone*, by Richard Preston, about a true incident that occurred in Reston, Virginia, in 1989.

13. Schwartau notes that the cold war left the US better prepared to defend overseas interests than interests within US borders. He suggests America may have to rethink current government policies to deter terrorism within the country. Schwartau, 31. Dr Magyar believes that terrorist activity would probably continue to be an internal function relegated to the police. The Alternate Futures team felt, in line with Schwartau's idea, that at the least some National Guard forces might receive specialized training. Magyar, interview.

14. The Kurds have long attempted to form their own state on lands currently ruled by Iraq, Iran, and Turkey. Daniel S. Papp, *Contemporary International Relations* (New York: Macmillan College Publishing Co., 1994), 43.

15. Statistical projection of current populations using 1995 population growth rate in the countries noted. *The World Factbook 95* (Washington, D.C.: Central Intelligence Agency, 1995).

16. As the colonial empires of the European powers collapsed in the aftermath of WW II, these newly independent states were often formed using the old colonial boundaries. In some cases this resulted in one nation or tribe being "divided among several states, whereas in other instances, one nation or tribe found itself in a multinational state, in the minority, and powerless to influence governmental policy decision making. Thus, colonialism . . . carried with it the seeds of instability and uncertainty that plague so much of the world today." Papp, 41. Dr Magyar has observed that these will be wars of consolidation, much larger than tribal wars which used to occur commonly in Africa. Magyar, interview.

17. In 1994, estimates of the world's refugee population ranged from 20 million to 40 million. For the US, the problem often arises in deciding whether refugees are political refugees or economic refugees. Initially Haitian economic refugees were returned to their island, though they claimed to be political refugees. Cuban refugees were granted asylum because Fidel Castro and the communists control Cuba. Papp, 116-117, 259, 517.

18. Approximately 50,000 Rwandans died from cholera in refugee camps in Zaire before adequate water purification and medical units were established. Steve Harding, "Hope comes to Rwanda," *Soldiers* 49, no. 10 (October 1994): 13-17. See also Michael J. Tooles, "Are War and Public Health Compatible," *The Lancet*, 8 May 1993, 1193-1196.

19. Appendix B provides trend data suggesting that the number of states in the world will increase to approximately 250 by the year 2025. *Gulliver's Travails* postulates an increase that is only 19 percent greater than linear projections.

20. The Tofflers believe that unless the UN is dramatically restructured it will continue to play a smaller role in whatever future the world finds itself in. Toffler and Toffler, 250.

21. Patterned after *The National Military Strategy of the United States of America* (Washington, D.C.: US Government Printing Office, 1995).

22. *Strategic Assessment 1995* notes several instances in which government policies have proven either counterproductive or only partially effective. *Strategic Assessment 1995*, 198-205.

23. The launch date for the first US-sponsored space station is November 1997. That schedule might be delayed if Russia cannot provide the module for which they are responsible. "World in Brief: Space Station Push," *The Atlanta Journal-Constitution*, 27 March 1996.

24. Space-borne ASATs present a greater technical challenge to successfully field than land-based ASATs. Objects in space are normally separated by large distances and "due to the energy requirements, satellites normally are not very maneuverable relative to their orbital path." Electronic message, Col Gerald Hasen et al., **2025** Technology Team, Air Force Institute of Technology, Wright-Patterson AFB, Ohio, 9 April 1996. Some computer systems in satellites can be made resistant to certain nuclear effects by replacing silicon-based devices with ferroelectric materials. For instance, ferroelectric materials are resistant to electromagnetic pulse (EMP) effects.

They are also nonvolatile, meaning their memory is not altered following a power loss. That nonvolatility is a major reason commercial firms are developing these materials. Such a development would be typical of the DOD's reliance on dual-use technologies in many of the alternate futures. Kevin C. Smith, *Response Surface Study of Fatigue in Ferroelectric Memory Devices* (Wright-Patterson AFB, Ohio: Air Force Institute of Technology, 1992).

25. From 1880 to 1987, the observed global average temperatures rose about 3 degrees Fahrenheit. By 2025, projections for further warming range from 1 degree to 5.5 degrees. If the greenhouse effect culminates in melting the ice caps, then 37 island states would literally disappear, simultaneously driving 72 million Chinese from their homes. Other nations would also be impacted. Papp, 556.

26. Marvin Cetron asserts that "the international treaty signed at Rio in 1992 was only the first step toward environmental cooperation on a global scale." Marvin Cetron, *74 Trends that will Affect America's Future—and Yours—in the Year 2000* (Bethesda, Md.: World Future Society, 1994), 3.

27. At the end of the June 1992 Rio Earth Summit, over 150 states signed a treaty "calling for countries to reach agreement on climate improvement and the reduction of carbon dioxide emissions." Papp, 558.

28. An example of biomass is the conversion of grain into alcohol for use as a fuel. William Hoagland, "Solar Energy," *Scientific American*, September 1995, 137.

29. *Strategic Assessment 1995*, 184.

30. DOD just completed its third and final round of base closures and realignments under current legislation. This last round affected 146 domestic military installations. Where possible, functions and operations were consolidated to reduce infrastructure. Another important consideration was operating costs. The Air Force Reserve and Air National Guard units at Chicago O'Hare International airport were closed because of high costs associated with heating facilities and plowing runways. Other facilities were closed or realigned because of similar concerns about operating costs associated with energy or environmental mitigation. Defense Base Closure and Realignment Commission, *1995 Report to the President* (Arlington, Va.: The Defense Base Closure and Realignment Commission, 1995), ix, 94–95.

31. From 1985–1993 the US economy grew at a rate of 2.3 percent annually. *Gulliver's Travails* experiences lower rates due to the Constrained Δ TeK. Appendix B provides some sensitivity analysis for various growth rates. *Statistical Abstract of the United States 1995* (Washington, D.C.: US Government Printing Office, 1995).

32. One group believes such a shake-out is already in progress, inspired by the "adverse structural characteristics of defense contracting." Summarized, the bureaucratic and regulatory process minimizes profits, particularly with declining production runs in areas that benefit only when economies of scale are rewarded. *Strategic Assessment 1995*, 203.

33. C-17s provide lift for the outsize cargo that will not fit on commercial carriers, and commercial aircraft transport carry the majority of passengers,

bulk, and oversize equipment. Bulk cargo can be palletized or containerized; oversized cargo is generally not palletized and can fit on most commercial aircraft. Some oversize equipment requires C-5 or C-17 cargo bay capabilities. Cargo that must be moved by sea lift is usually either too large or too heavy to move by air, or doing so would be inefficient. Commercial aircraft are financially compensated via the Civil Reserve Air Fleet (CRAF) program. In *Gulliver's Travails* this compensation includes federally provided insurance coverage in the event an aircraft is damaged or destroyed. More information on air and sea lift can be found in the following four texts: Col John A. Warden et al., *Concepts in Airpower for the Campaign Planner* (Maxwell AFB, Ala.: Air Command and Staff College, 1993); Lt Col John L. Cirafici, *Airhead Operations* (Maxwell AFB, Ala.: Air University Press, 1995); Air Vice Marshal R. A. Mason, *Air Power: An Overview of Roles* (McLean, Va.: Pergamon-Brassey's International Defense Publishers, 1987); and Lt Col Donald E. Ryan, *The Airship's Potential for Intertheater and Intratheater Airlift* (Maxwell AFB, Ala.: Air University Press, 1993).

34. RO/ROs are considered fast sea lift and during Desert Storm generally reached the Kuwaiti theater of operations within three weeks from departing the CONUS. Container ships are similar to the breakbulk cargo ships of WW II, except that containerization has decreased port time from as much as 60 percent of a voyage, to less than 10 percent. There are no prepositioned overseas materiel configured for unit sets (POMCUS) in this world. Until 2008 these supplies were located in Europe, in support of NATO contingencies, but POMCUS was removed as part of the fallout of NATO's inability to contain the Turko-Kurdish conflict that started in 2004. Lt Col Ryan, in his thesis for the School of Advanced Airpower Studies, proposes the use of dirigibles as an alternate lift asset that is significantly faster than sea lift, yet carries more cargo than a C-5 for a fraction of the airframe manufacturing cost. Dirigibles might be a very useful, and practical, tool in this alternate future. For more information on dirigibles and sea lift consult Ryan.

35. While commander in chief of US Space Command in the mid-1990s, Gen Kutyna provided testimony to the Senate Armed Services Committee indicating an ever-increasing threat from third world tactical ballistic missile systems. Given the 30 years until 2025, that problem is only likely to intensify. Maj James P. Marshall, "Near Real-Time Intelligence of the Tactical Battlefield," *Theater Air Campaign Studies* (Maxwell AFB, Ala.: Air Command and Staff College), 234.

36. The first UAVs or remotely piloted vehicles (RPV) were designed in the 1930s when the Royal Air Force conducted experiments with radio-controlled drones. During WW II over 14,000 of these RPVs were delivered to the US Army and Navy. In 1987, Lockheed was developing the Aquila for the US Army to carry a "high-resolution TV camera, a laser for target ranging and designation and multimode video tracker." The entire package was to weigh less than 70 pounds, have an ultra-low radar cross section, and have an endurance of three hours at a range of 30 miles. Such a package is

easily carried to the war zone; most of the baggage consists of equipment vans for the controllers. UAVs have several advantages: reduced manpower requirements, less vulnerability when airborne, reduced aircrew exposure, lower training requirements, significantly lower fuel requirements. To date they suffer from restricted payloads, vulnerabilities to jamming, and inflexibility in the face of the unknown. However, it is quite likely that deficiencies will be overcome in the years of technical development preceding 2025. Mason, 84-88. Also, the *New World Vistas* report by the Air Force Scientific Advisory Board is highly optimistic regarding the future development of unmanned or "uninhabited" aerospace vehicles. See *New World Vistas: Air and Space Power for the 21st Century, Summary Volume* (Washington, D.C.: Air Force Scientific Advisory Board, 1995), 34-36.

37. The distribution of power within a coalition shifts between members over time, particularly as objectives approach completion and assessments are made in light of a changed situation. As a result, "your partner today could be your enemy tomorrow." Vicki J. Rast and Maj Bruce R. Sturk, "Coalitions: The Challenge of Effective Command and Control in Support of the Air Campaign," in Maj Glenn Cobb, ed., *Theater Air Campaign Studies* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 170.

38. Increased reliance on space-based systems is in line with prognostications by many. Toffler, 158.

39. Desert Storm bilingual personnel were vital liaisons, aiding mutual understanding and acting as translators for intelligence information that flowed between the coalition partners. Rast, 173.

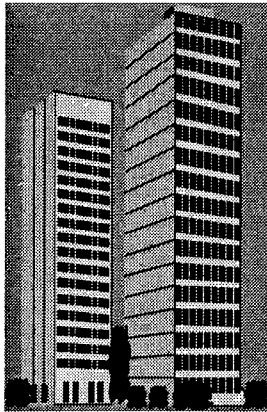
40. This is a 1996 problem, identified in Joint Pub 1 amongst other publications, magnified by the greater number of actors in 2025. *Joint Warfare of the US Armed Forces* (Washington, D.C.: National Defense University Press, 1991), 3.

41. Some suggest that the services will evolve towards an "interservice centralized military command." Schwartau, 29.

42. Some analysts believe those three steps are just a few that should be taken by the year 2000. These steps seem plausible by 2025 in *Gulliver's Travails*, given the reliance on commercial derivatives to support most military operations. *Strategic Assessment 1995*, 203; and Toffler, 167. Adm William A Owens noted in 1995 that the center of technical acceleration generally lies in the commercial, nondefense sector. Adm William A. Owens, "The Emerging System of Systems," in Maj Glenn Cobb, ed., *Theater Air Campaign Studies* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 205-209.

Chapter 4

Zaibatsu



In 1996, “*zaibatsu*” is Japanese for a family corporation held together by economic bonds.¹ But in this world of 2025, “*zaibatsu*” means much more. *Zaibatsu* is a world dominated by corporate economic interests. Multinational corporations (MNC) have become extremely powerful and have loosely bonded together to serve their financial interests. The “*zaibatsu*,” as used here, is the informal collection of MNCs cooperating to manage growth and maximize profits. Though some might view *Zaibatsu* as being prone to corporate greed and excess, usually there is peaceful cooperation to further world economic growth.

However, conflicts do occur when competition for emerging markets or newfound resources drives corporations to attack one another. When disputes occur, the *Zaibatsu* often acts against one corporation or another through surrogates such as states involved in border disputes or ethnic groups seeking better trade conditions. These conflicts are usually short-lived since the *Zaibatsu* considers wars bad for profits.

In *Zaibatsu*, the American worldview is Domestic because of the relatively benign nature of this world (fig. 4-1). Profit-seeking corporations have fueled Exponentialⁿ technology growth and proliferation. The World Power Grid is Concentrated as power resides in MNCs acting collectively to increase profits.

ALTERNATE FUTURES FOR 2025

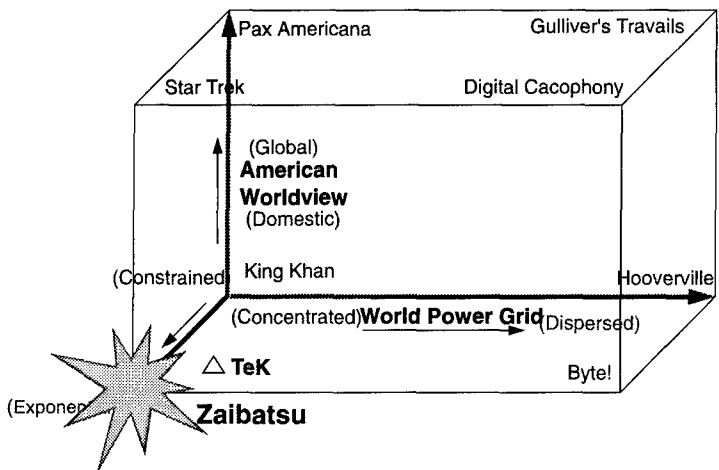


Figure 4-1. Strategic Planning Space for Zaibatsu

In this world, MNCs have grown in strength, exerting sovereignty by virtue of the tremendous increase in international trade (fig. 4-2) and corporate influence in international organizations.² Since MNCs conduct most of the

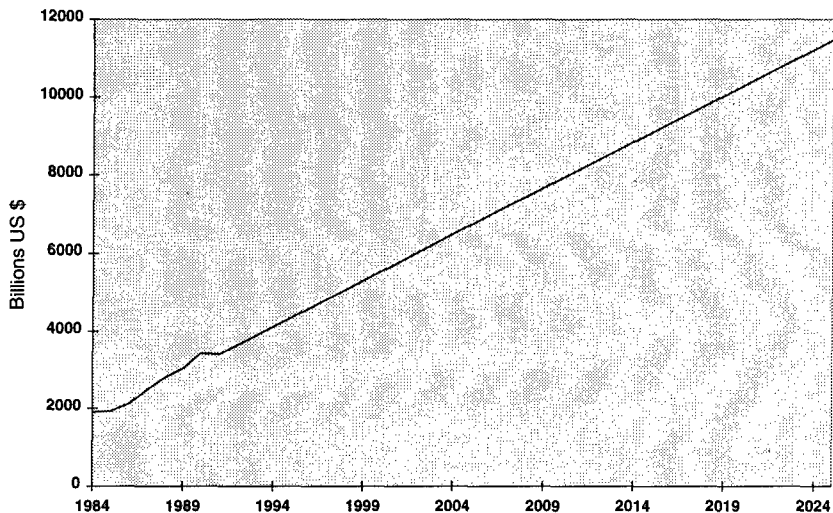


Figure 4-2. Trend in International Trade³

international trade, their influence is increasing relative to the sovereignty of states. The Zaibatsu seems to control everything, including the number and nature of conflicts. Military forces serve as de facto “security guards” to safeguard multinational interests and proprietary rights. However, this role is becoming more difficult as rising income disparities fuel resentment among the less-developed countries.

Plausible History

The world of *Zaibatsu* is characterized by the growing strength of MNCs. As the timeline in figure 4-3 indicates, the prosperity generated by a US-balanced budget in 2002 preceded this growth.⁴ The ever-increasing interdependence of MNCs and the resulting general rise in prosperity have encouraged worldwide political, economic, and military cooperation. This increase in world cooperation led to a UN-backed effort to deploy a planetary defense system in 2007.⁵

In 2010, computer technology leapt forward with the development of a microprocessor human-nerve interface which greatly increased the “intelligence” of computers.⁶ This development sparked a technological revolution that rapidly proliferated throughout the world and increased corporate profits. Corporations began to merge operations to better

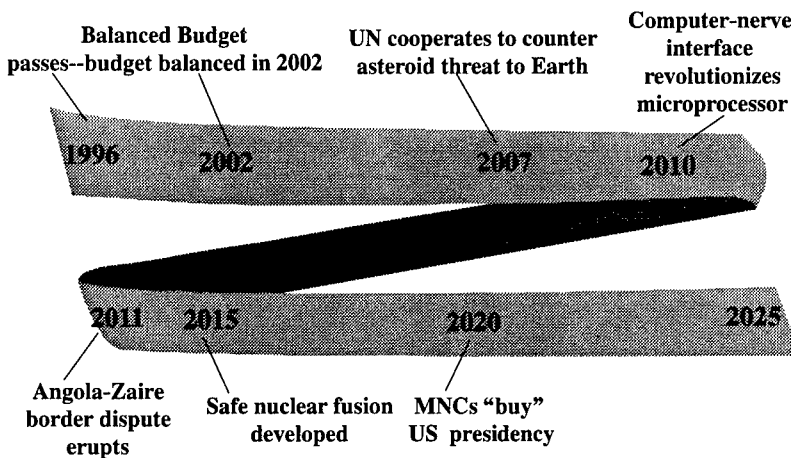


Figure 4-3. Plausible History for *Zaibatsu*

integrate various technologies while downsizing management and administrative functions.⁷

Despite the benefits derived from new technologies, occasional problems emerged, such as the Angola-Zaire border clash in 2011 (see map at fig. 4-4).⁸ Powerful corporations used this conflict to settle an oil-drilling-rights dispute.⁹

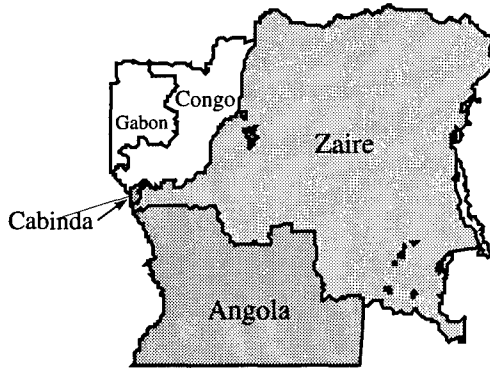


Figure 4-4. Map of Angola-Zaire Conflict Region

In the year 2015, safe nuclear fusion was developed, and it now provides a significant portion of the world's electrical needs.¹⁰ As a result of the reduced demand, the price of oil fell to \$10.00 a barrel in 2017.¹¹

In the 2020 presidential election, MNCs heavily influenced the outcome by contributing millions in "soft" money to a pro-business candidate.¹² In 2025, MNCs exert the dominant political force in *Zaibatsu* as most elected officials owe them their political careers.

The Nature of Actors

The principal actors are the multinational corporations known collectively as the *Zaibatsu*. MNCs form the major centers of power in a Centralized World Power Grid, and because of their influence, state sovereignty is less important.¹³ The *Zaibatsu* aggressively supports the establishment of powerful free-trade zones, further eroding state sovereignty. These free-trade zones contribute to the high

degree of economic interdependence, preventing any state from acting to support indigenous corporate activities without adversely affecting many other states.¹⁴ Because of this recognized interdependence, wars are generally considered bad for profits and therefore are discouraged by the Zaibatsu.

The Zaibatsu often acts through the UN to maintain a relatively peaceful world. The UN is highly regarded for its effectiveness in dealing with complex global problems such as the asteroid threat. The UN implicitly supports Zaibatsu activity since their aims are peaceful and promote world development, directly supporting the UN charter.¹⁵ In addition, the Zaibatsu lobbies the US and other countries with capable security forces to provide the majority of the UN's small but technically advanced mobile military. The UN uses these air, land, sea, and space forces to contain disturbances and to maintain relatively peaceful global conditions.

The world is partitioned into seven major technological development regions. These areas are the US, the European Union (EU), Australia, China, Israel, India, and Ukraine. Other important areas such as Latin America, North Africa, and Russia remain underdeveloped and provide raw materials and cheap labor. The standard of living is rising everywhere, but the seven technological development regions are increasing their lead in per capita income.¹⁶ This situation creates a potential source of instability as the gap between the haves and have-nots continues to widen.¹⁷ The seven development regions cooperate on most issues because of a strong Zaibatsu influence. However, global markets in niche areas spawn intense competition between the various regions.¹⁸

The Nature of International Politics

The key Zaibatsu objective is to ensure that international relations remain stable and thus conducive to trade and profits. As a result, international law is intricately linked to corporate law. Actors whose actions threaten profits and business—such as going to war without Zaibatsu support—are dealt with swiftly and severely. If the Zaibatsu cannot coerce the offending parties economically, then it secures UN involvement, relying on UN credibility to quell disturbances.

The UN can respond with permanently committed military forces, sometimes involving the US.

Most natural resources are controlled, mediated, and distributed by the *Zaibatsu*. The *Zaibatsu* also develops new markets and sources of skilled labor. Due to the intense competition for these resources among various MNCs, conflicts occasionally occur with various groups acting as surrogates. When these conflicts occur, the UN may be pressured by both sides to get involved. Sometimes, the UN deploys peace enforcers to the displeasure of both sides, placing involved US military forces at risk.¹⁹

Conflicts usually occur in the developing areas of Latin America, North Africa, and Russia. When conflicts occur, the *Zaibatsu* works through the UN and other international bodies to restore order quickly. Where American-based MNCs are heavily invested in developing countries, they may place considerable pressure on the US government to get involved when conflicts occur that are not being resolved to the US corporations' satisfaction.²⁰

The Nature of US National Security Strategy

Since *Zaibatsu* is a relatively peaceful world, there are few threats to US interests. Therefore, the strategic challenge for the military in this world is to remain relevant and proficient in a peaceful but potentially unstable world. The national security strategy is peace through world cooperation and multilateral deterrence. International economic interdependence is viewed as the primary deterrent to conflict. When *Zaibatsu* interests are threatened, the US military often acts with the UN to resolve conflicts. When conflicts occur, the US military can respond quickly by enforcing UN-backed blockades and embargoes. Each of the seven development regions maintains security forces to preserve stability. Consequently, US forces rarely act unilaterally, so far fewer military forces are required to preserve US interests.

The Nature of Humanity

Human nature in this world is dominated by materialism.²¹ Many religious, ideological, and cultural differences have been

co-opted by economic concerns. However, a strong anti-materialistic attitude remains among some religious fundamentalists.²² Additionally, greed and a growing opulence are increasing social tensions as some resent the increasing difference in income between the wealthy and the middle class. Finally, poor people still exist in many areas despite the overall rising standards of living. The forces of greed, resentment, and religious fundamentalism threaten stability as the Zaibatsu is unable to co-opt everyone.²³

The Nature of Technology

In *Zaibatsu*, Δ TeK is Exponentialⁿ as technological innovations rapidly proliferate around the world. The low cost of entry permits niche corporations to exploit breakthroughs, thus fostering an entrepreneurial attitude worldwide.²⁴ Technology advances at a revolutionary pace as the seven development regions fuel innovation through competition. Maintaining technological leverage is difficult in this world as access to organized information is nearly ubiquitous.

To ensure long-term market growth, the Zaibatsu funds the development of highly efficient infrastructures.²⁵ Mass transit systems using magnetic levitation create interstate systems of bullet trains reaching average speeds of 300 mph.²⁶ These mass transit systems eliminate the burden of maintaining large road networks. Automobiles are now used solely for pleasure or as a means to reach mass transit stations. Additionally, the Zaibatsu developed transatmospheric vehicles which permit the rapid movement of critical resources and finished goods.²⁷ Investments in information and communications technologies provide worldwide interoperability, and the information highway has evolved into an information-communication continuum.

MNC profits have soared due to these and other revolutionary advancements, including spectacular studies in genetics.²⁸ Researchers have identified the desirable genes for various careers and professions. This breakthrough offers the potential to genetically engineer the next generation of workers and professionals.²⁹ Consequently, the military plans to genetically engineer some of their future personnel accessions

if ethical questions can be resolved.³⁰ Understandably, most people are still uncomfortable with manipulating human life.

The Nature of the Environment

Zaibatsu is characterized as a “gray” world because the developed areas are environmentally clean and have sufficient resources while the developing areas are polluted and experience resource shortages. Technological advances, such as the widespread use of nuclear fusion, have reduced the demand for fossil fuels for electrical production. However, advances in technology often have led to other problems. Air and noise pollution in developing areas are causing serious health problems.³¹

Additionally, MNCs exploit many developing nations by dumping toxic wastes in the environment and operating “sweat shops” with the emphasis on profits over human rights.³² The developing nations tolerate these sweat shops because they are accompanied by *Zaibatsu* investment in infrastructure to foster long-term economic growth. Many of the underprivileged believe their children’s lives will be better than theirs because of improving standards of living.

The Nature of the Defense Budget

The US reduced the DOD’s budget (fig. 4-5) beginning 30 years ago as part of the effort to balance the federal budget. Once MNCs began influencing world events and mitigating conflicts, the absence of threats to US interests caused DOD spending to remain well below 1996 levels. Meanwhile, MNCs spurred economic growth throughout much of the world. As a result, the US gross domestic product grew at an average rate of 5 percent over the past 30 years. This growth has resulted in a current US GDP of \$29 trillion in 1995 dollars.³³ At \$200 billion, the DOD budget represents less than 1 percent of GDP.

Because many potential adversaries can afford to purchase modern and sophisticated weaponry, the potential threat to US forces is increasing over time. To meet this growing threat and contain modernization spending, the US military relies heavily on technological improvements from the commercial sector. Even using this strategy, the US military has lost its

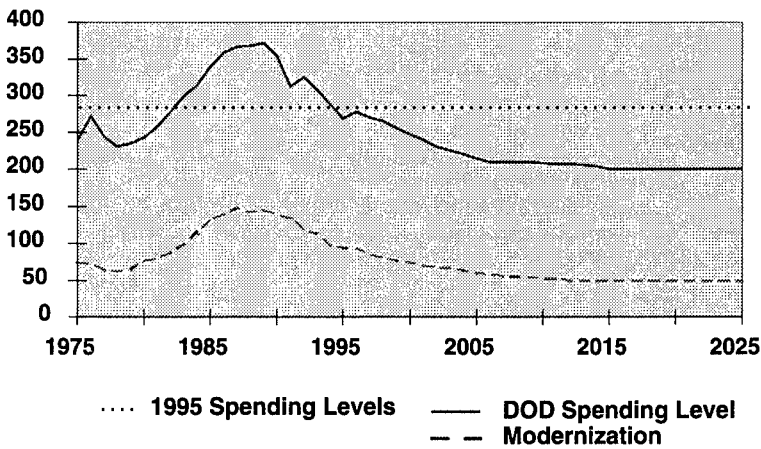


Figure 4-5. DOD Budget (Constant FY95 \$B) in *Zaibatsu*

technological edge in areas such as software and information warfare.

Capabilities

There are few areas in this world that have *not* been privatized by the *Zaibatsu*.³⁴ For instance, base commanders must be adept at negotiating with MNCs for base services and utilities. The military depends on private firms for all of its mobility and uses commercial virtual reality simulators and war games to retain proficiency in war-fighting skills. Only the evolving nature of the threat provides a rationale to train and equip with leading edge technologies.

A major threat to the *Zaibatsu* interests exists in the infosphere. As a result, information warfare is a primary focus of day-to-day military operations, detecting and countering industrial espionage.³⁵ This focus is a critical issue because corporate information systems provide a large portion of defense-related intelligence. For security reasons, MNCs employ their own "super" clipper chips and advanced encryption techniques to control access.³⁶ Consequently, the services must constantly "decipher" the latest chips and encryption keys to maintain access.³⁷

Several other DOD capabilities are needed in *Zaibatsu*. First is the ability to enforce the primary *Zaibatsu* punishment tool—the economic embargo, or sanctions; second, guarding against individuals and groups illegally milking company profits and databases—electronic pirates and “info-bandits”; and finally, using biogenetics to reduce training costs and attrition by “creating” the perfect soldier.³⁸ Essentially, the military is offensive in nature and most operations are conducted near the US or in conjunction with the other development regions.

Implications

Zaibatsu poses many challenges to the US military. The first challenge is to remain relevant. Because of the relatively benign nature of this world, the tendency is to stagnate or become preoccupied with ancillary missions. Additionally, war-fighting skills atrophy because of the reduced opportunity for experience.³⁹ Because the majority of space and sensor technologies are developed at consortium labs, rather than national facilities, the US must depend on MNCs for space support. Many military training areas suffer from high congestion, air pollution, noise pollution, and electromagnetic interference. Additionally, the *Zaibatsu* continues to add to the number of training restrictions by closing some ranges and prohibiting aircraft flights over populated areas. This situation has affected readiness by reducing the opportunities for “live” training. Most training is now “virtual” and commanders worry about maintaining combat readiness. Finally, because defending *Zaibatsu* interests sometimes involves UN action, the US military often becomes involved in operations with no clear US interests at stake.

Summary

Zaibatsu is a world of powerful multinational corporations. Currently it is a relatively benign world, but tensions are building. The US military is small due to the absence of a perceived threat, with most of its activity oriented towards cooperation with international organizations and other militaries to deter and resolve conflicts. The American Worldview

is Domestic due to the lack of threats to US vital interests. Δ TeK is Exponentialⁿ due to investment and R&D funding by profit-seeking MNCs. Technology is used to fuel economic growth, in turn generating additional technological advancements. Finally, the World Power Grid is Concentrated. Power is held by MNCs who loosely bond together to further their economic interests.

Notes

1. Robert L. Kearns, *Zaibatsu America: How Japanese Firms are Colonizing Vital US Industries* (New York: The Free Press, 1992), ix-xiv, 2-4; and T. A. Bisson, *Zaibatsu Dissolution in Japan* (Berkeley, Calif.: University of California Press, 1954), 1. For a discussion of the Zaibatsu role in World War II and their subsequent disestablishment during the American occupation, see Kazuo Kawai, *Japan's American Interlude* (Chicago: University of Chicago Press, 1960); Russell Brines, *MacArthur's Japan* (New York: J. B. Lippincott Co., 1948); and William J. Sebald with Russell Brines, *With MacArthur in Japan* (New York: W. W. Norton and Co., 1965).

2. Stuart Elliot, "The Cuervo Republic Will Have a Constitution But No 18th Amendment," *The New York Times*, 12 March 1996; and Gerry Khermouch, "An Island of Their Own," *Brandweek* 37, no. 5 (29 January 1996): 18-19.

3. *Statistical Yearbook* (New York: United Nations, 1994), 11.

4. Richard J. Cebula, "Federal Government Budget Deficits and Interest Rates: A Brief Note," *Southern Economic Journal*, January 1992, 821-823; and Richard J. Cebula and James V. Koch, "Federal Budget Deficits, Interest Rates and International Capital Flows: A Further Note," *Quarterly Review of Economics and Finance* 34, no. 1 (Spring 1994): 117-120.

5. One **2025** white paper discusses the techniques, timeframe, and technical risks associated with deploying a planetary defense system. The UN is one of the organizations suggested as a sponsoring body. Lt Col John M. Urias et al., "Planetary Defense" (2d draft white paper for Air Force **2025** study).

6. According to the *Worldwide Bioelectronics Collection Guide* (U), "Various biological molecules are currently being evaluated for bioelectronics. At present, bacteriorhodopsin (BR), a protein found in the cell membrane of a salt-water microbe, *Halobacterium halobium*, appears to be the most promising protein under investigation. It has great potential for application in high-speed, high-density optical memory devices." Data can be stored, altered, or recovered at 3 picoseconds (3 trillionth of a second). A Microprocessor using "human" nerve interface is plausible and would deliver leaps in computer processing speed. *Worldwide Bioelectronics Collection Guide* (U) (Washington, D.C.: Director of Central Intelligence, December 1988), 1-2. (Secret) Information extracted is unclassified.

7. Cetron states, "A typical large business in 2010 will have fewer than half the management levels of its counterpart today [1996] and about one-third of the number of managers"; and, "Middle management will all but disappear as information flows directly up to higher management for analysis." Marvin Cetron, *An American Renaissance In The Year 2000* (Bethesda, Md.: Future World Society, 1994), 8.

8. Dr Magyar points out that Angola's Cabinda is an oil-rich province that has historically attempted to secede from Angola. Zaire has often supported those efforts. Cabinda is separated from Angola by 30 miles of Zaire territory. Dr Karl P. Magyar, faculty, Air Command and Staff College, Air University, Maxwell AFB, Ala., interview with one of the authors, 9 April 1996.

9. Angola's Cabinda province has regionally significant reserves of oil. Conflict in the region began in the 1970s with Cuban-backed Angolan troops protecting US corporate property from US-supported Zaire troops. Conflict over oil rights is plausible in this timeframe because safe nuclear fusion is not developed until four years later. Magyar, interview.

10. Cetron states that "fusion reactors producing 'clean' nuclear energy will appear after 2010; by 2030 they will be a major source of power." Cetron, 9. For contrary views on the imminence of commercial fusion see appendix B.

11. Steve Hanke discusses the relationship between oil prices and supply. He cites several factors leading to lower oil prices in the future. For instance, "since 1944 worldwide annual production as percent of reserves has steadily fallen from over 5 percent to less than 2.2 percent today." In other words, "in 1944 we had 20 years' worth of known reserves in the ground. After more than half of century of 'prodigal' consumption, we have 45 years' supply." Several non-OPEC countries are developing oil resources and some OPEC members have left the cartel. These developments will lead to a glut in oil supply. Consequently, prices will fall. In 2025, if demand is reduced due to reliance on other, and cheaper, means, prices will fall to levels much lower than 1996 prices. Steve H. Hanke, "Oil prices are going down," *Forbes* 157, no. 4 (26 February 1996): 140.

12. Both President Clinton and Senator Dole are taken to task in Jimmy Carter's book *The Buying of the Presidency* for providing legislative favors to corporations in return for significant campaign contributions. Molly Ivins uses this point to support her contention that America is evolving into a corporate oligarchy. Molly Ivins, "A Look at the Real State of the Union," *The Atlanta Journal-Constitution*, 27 January 1996.

13. Originally, *Zaibatsu* consisted of large MNCs, such as those found in the Fortune 500. The 2025 advisors, during the Alternate Futures briefing on 7 February 1996, pointed out that large MNCs were on the decline because of the growth of small companies using technology. Various members used the automobile and aerospace industries to illustrate their point. As a result, the Alternate Futures team changed the concept of "large" MNCs to "powerful" corporations. Those MNCs may not be large in number

of employees but do control a large share of the market, such as Microsoft in the 1996 computer software industry.

14. Cetron states that "regional political and economic arrangements such as the European Union, the Organization of American States, and the North American Free Trade Agreement will play a larger role in world political and economic affairs." Cetron, 3.

15. *Yearbook of the United Nations 1993*, vol. 47 (Boston: Martinus Nijhoff Publishers, 1994), 1335.

16. The **2025** advisors asked a question regarding the disposition of the "haves" and "have-nots" on 7 February 1996. The team determined "all boats would rise" with the increase in multinational corporation profits, but the gap between "haves" and "have-nots" would widen.

17. Kennedy discusses the factors contributing to the separation between "winners" and "losers" in the developing world. He states "At the moment, . . . the usual cluster of factors influencing relative economic performance—cultural attitudes, education, political stability, capacity to carry out long-term plans—suggests that while a small but growing number of countries is moving from a 'have-not' to a 'have' status, many more remain behind. The story of winners and losers will continue, therefore, only this time modern communications will remind us all of the growing disparity." Paul Kennedy, *Preparing for the Twenty-First Century* (New York: Random House, 1993), 193-227.

18. Lt Gen Jay W. Kelley, the study chairman, has described the Zaibatsu as the National Football League with the seven development regions being the team owners. They cooperate on issues to increase revenues but competition remains intense on secondary issues (such as winning games or developing new markets).

19. In *Zaibatsu*, the UN retains some degree of autonomy. Even though the UN often acts in Zaibatsu interest, it will act as a "third-party" to resolve conflicts involving two Zaibatsu surrogates.

20. This pressure comes from the contributions made to candidates to safeguard MNC interests.

21. *Zaibatsu* is also known as "schmooze" world because advancement in the corporate structure requires a certain amount of "playing the game." The key corporate rewards are getting noticed by the boss and going to lunch or playing golf with superiors.

22. Kennedy discusses the impact of Islam in hindering economic development in much of the Arab and Muslim world. Additionally, he discusses the resentment of many Islamic religious fundamentalists towards foreign powers and materialism. Kennedy, 208-211.

23. For a recent example of the tensions between corporate technological "opportunism" and the plight of those left behind, see John Stremlau, "Dateline Bangalore: Third World Technopolis," *Foreign Policy*, Spring 1996, 152-168.

24. Cetron states that "globalization of the economy calls for more independent specialists. For hundreds of tasks, corporations will turn to teams

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of consultants and independent contractors who specialize more and more narrowly as markets globalize and technologies differentiate." And, "The 1990s will be the decade of microsegmentation as more and more highly specialized businesses and entrepreneurs search for narrower niches." Cetron, 6, 11.

25. The Zaibatsu use their ingenuity to rapidly improve infrastructure. They use advanced technology when necessary but low technology solutions where appropriate. For example, many industrial countries use bicycles for commuting where possible to reduce pollution, congestion, noise, and parking problems.

26. Magnetic levitation trains in Japan already travel at speeds up to 320 mph. Speeds of 200 mph are possible on unimproved tracks within the US. See "Swords into Plowshares," *Discover* 16, no. 11 (November 1995): 36.

27. Transatmospheric vehicles are systems that provide spacelift and weapons deployment from the earth's surface to low earth orbit using a rocket-powered vehicle that takes off from a runway like a conventional aircraft. The vehicle starts with a full load of propellant but minimal oxidizer. It flies up to rendezvous with a subsonic air refueling tanker to pick up a full load of oxidizer before continuing to orbital altitude and speed. *Spacecast 2020: Operational Analysis* (Maxwell AFB, Ala.: Air University, 1994), 34.

28. Cetron states that "genetic engineering will do \$100 billion worth of business by 2000. . . . Newborn babies will be artificially endowed with particular disease immunities." Cetron, 5.

29. John L. Petersen, *The Road to 2015* (Corte Madera, Calif.: Waite Group Press, 1994), 54.

30. Cetron states that "the ethical issues raised by technologies such as organ transplants, artificial organs, genetic engineering, and DNA mapping will cause a growing public debate." Cetron, 5.

31. Worsnop states that prolonged exposure to noise at 85 decibels and above is being linked to numerous health problems. Studies have established that loud noise causes permanent hearing loss, constricts blood vessels causing less blood flow to vital organs, affects the entire nervous system, sparks seizures in epileptics, and disturbs unborn children to the point of causing possible harm. Richard L. Worsnop, "Indoor Air Pollution," *CQ Researcher* 5, no. 40 (27 October 1995): 958.

32. During the Alternate Futures briefing on 7 February 1996, the **2025** advisors felt eventually corporations would assign a "cost" to pollution and would discontinue damaging the environment when costs exceeded marginal return. The Alternate Futures team felt these costs have traditionally been difficult to assess and would not occur before the MNCs significantly damaged the developing countries' environment. Therefore, *Zaibatsu* remains characterized as a "gray" world.

33. US GDP in 1995 was approximately \$6.74 trillion. At a growth rate of 5 percent over the next 30 years, the US GDP would be \$29.1 trillion in

1995 dollars. *The World Factbook* (Washington, D.C.: Central Intelligence Agency, 1995), 444.

34. Cetron states that "privatization is a growing trend, with governments around the world selling off public services. . . . Globally, this means a transition from governmental to private ownership of airlines, railroads, water, and electricity." Cetron, 4.

35. Schwartau believes industrial espionage will define relations between the world's economic regions, those competing at the leading edge, and those attempting to vault into, or over, the industrial development phase. Winn Schwartau, *Information Warfare* (New York: Thunder's Mouth Press, 1994), 47.

36. William H. Gates III, *The Road Ahead* (New York: Viking Penguin, 1995), 270.

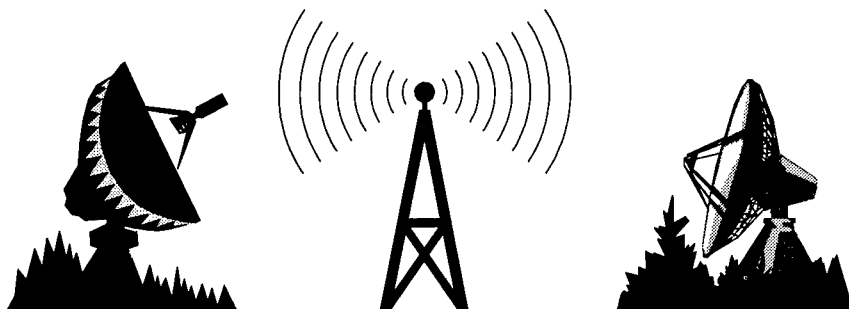
37. Remarks by National Reconnaissance Office personnel following an Alternate Futures briefing on 22 January 1996. NRO personnel stated that military access to commercially encrypted communications was already becoming a problem and would become a big problem in the future.

38. Lecture on the Joint Cognitive Job Analysis System on 18 October 1995 to the **2025** Study participants. The lecture discussed new screening tools to reduce training costs and attrition. The point made was that if the "right" traits and characteristics could be identified then the "right" people could be accepted into the military. Most people in the audience were visibly upset with the notion of selecting only those people who fit a certain profile for military duty. However, everyone admitted that selection of "right" people would lower costs and reduce attrition.

39. US Army aviation has already demonstrated that an institution can "forget" about a skill and mission if it loses the systems to perform the mission and fails to preserve the idea in its doctrine. Ronald Fogleman documents how the US Army attrited specialized ground attack aircraft after WW I to the point the task could not be effectively trained. Eventually, ground attack began to disappear from army aviation doctrine. Ronald R. Fogleman, "The Development of Ground Attack Aviation in the United States Army Air Arm: Evolution of Doctrine, 1908-1926" (master's thesis, Duke University, 1971).

Chapter 5

Digital Cacophony



Imagine a world completely enmeshed in technology. Technological advances are rampant and the world struggles with rapid change and its effects.¹ These tremendous advances in technology have led to the development of many astonishing inventions, such as an individual device that can perform a myriad of simultaneous functions. For instance, a watch phone can be used to conduct video-phone calls and teleconferences;² monitor a daily schedule, including required tasks and to-do lists;³ display global positioning satellite (GPS) location to include altitude; and even monitor aerobic conditioning, energy, nutrition rates, emotional state, and the status of artificial organs.⁴ However, many traditional customs and events have faded away, erased by the extreme rate of change. Most holidays are overlooked, and Julian dates⁵ are the norm.

Technological progress has led to adverse effects as well, creating almost as many problems as it has solved.⁶ For example, technology has produced some harmful physiological side effects for the human body, causing most humans to have at least one transplanted organ by the time they are in their mid-thirties. Fortunately, advances in biotechnology rectify many medical conditions.⁷ The proliferation of technology has made the world more susceptible to random violence but also has provided the means to avoid some threats. For instance, since technology provides virtual experiences better than

anything live, and large crowds present a target of opportunity to terrorists and disgruntled groups, nearly all sporting events, plays, shows, and theater events are “experienced” at home.⁸

This world is entitled *Digital Cacophony*, due to its often discordant nature. Of the six alternate futures, this world is by far the most advanced in Δ TeK and offers the greatest promise of wealth and power for the individual. On the other hand, it is also the most dangerous for both individuals and states. Figure 5-1 illustrates *Digital Cacophony*’s position in the strategic planning space.

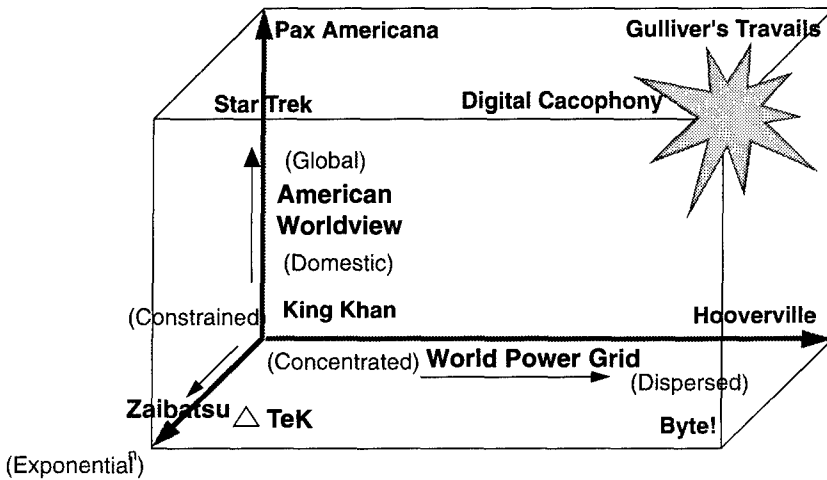


Figure 5-1. Strategic Planning Space for *Digital Cacophony*

In this world, technology has empowered many individuals, but at the same time disenfranchised numerous governments and organizations. Due to the Exponentialⁿ proliferation of Δ TeK, everyone has instant access to global networking and the burgeoning, almost omniscient, database system.⁹ Unparalleled Δ TeK development has sparked explosive economic growth across the planet. However, those who do not fully share in the wealth of these ventures use technology to terrorize the elites, using weapons of both an insidious and overt nature. Nation-states have lost vitality as independent entities since information and wealth cross international

boundaries with impunity.¹⁰ Electronic democracies are the political system of choice, with everyone having a direct vote on every issue.¹¹ This creates “fuzzy states” with shifting policies at times. Life in this world is full of promise . . . but this is also a world of fear.

Plausible History

In the world of *Digital Cacophony*, technology brings people together, but also tears them apart. As seen in figure 5-2, the year 2000 was a benchmark in many ways. For the first time, the world was “wired,” and anyone could gain access to worldwide information.¹² This development exacerbated social unrest globally as have-nots learned how little they had compared to the well off.¹³ Meanwhile, nuclear proliferation continued unabated, spreading to 20 states.¹⁴ International politics, overwhelmed by transparent information borders, could not control the spread of nuclear technology and materials.¹⁵ By 2002, ever-increasing technological breakthroughs in the genetic engineering of plants and animals led to an abundant food production capability,¹⁶ spurring population growth as a result of declining mortality rates in third world countries which previously suffered recurring famine.

Technology could not solve some old problems, as in 2009, when an influenza pandemic struck in southern China, then rapidly spread worldwide.¹⁷ Three hundred thirty million people were affected and over 30 million died.¹⁸ No one ever determined if the virus was a natural mutation or bio-engineered.¹⁹ Many feared the latter.

The threatened migration of unemployed masses from second-and third-world countries continued to challenge the few wealthy states. By 2010 the United Nations dissolved due to its inability to resolve these issues and regional conflicts.²⁰ In the resulting vacuum, bilateral and multilateral security arrangements between nation-states and interest groups flourished.

In 2012, Wall Street was hit with a super high energy radio frequency (HERF) wave, which destroyed all financial databases.²¹ Since advanced information warfare capability

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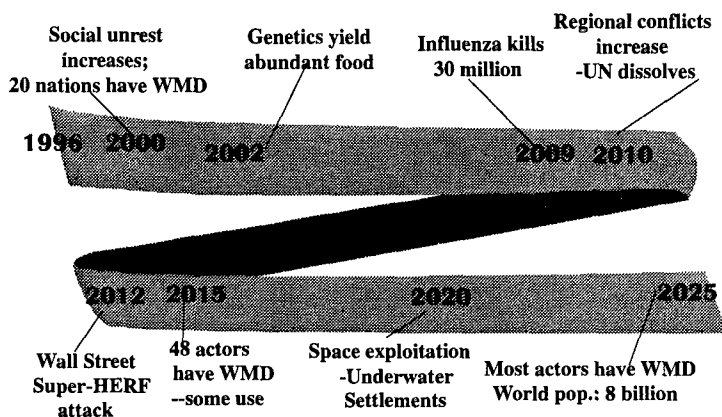


Figure 5-2. Plausible History for *Digital Cacophony*

was available worldwide, a number of competitor states were investigated, but tracing the source was impossible. The US economy was in turmoil for weeks during database reconstruction, and businesses demanded federal action to prevent further attacks.²²

By 2015, 48 actors had acquired several classes of weapons of mass destruction and the accompanying delivery systems.²³ Threats of conflicts involving nuclear, chemical, biological, and information weapons became common. During the North African territorial war, a tactical nuclear detonation killed thousands of people.²⁴

The world began an expansion into new frontiers by 2020. Space travel with accompanying outposts became common, and many multinational corporations established production facilities in space to exploit the solar system's resources.²⁵ However, space assets also became a target and required heavy protection.²⁶ Underwater settlements were also prototyped during the early 2020s to support mining operations of hydrothermal vents.²⁷

Many challenges face this world in 2025. Almost any individual or group can acquire weapons of mass destruction

or *disruption*, and threats are one of the few constant things in this world.

The Nature of Actors

The ubiquity of information and the affordable nature of high technology have led to a dispersal of power in this world. Nation-states have become less important, while individuals and small groups can now have tremendous impact on world events. Everyone communicates via the global net, even using it to do all their shopping by electronically hopping around the globe. Individuals can live in one country and work for an MNC in another country "on-line."²⁸

Continuous terrorist threats have caused an ever-present fear, and individuals prefer not to leave the security of their dwelling, let alone meet in large groups. Seemingly, only those individuals who are either overtly adventurous or covertly claustrophobic join organizations such as the active military, which entails much travel and danger. Others interested in serving do so on-line in the reserves.

In *Digital Cacophony*, individuals demand direct input regarding political decisions, and the government has become a virtual location, or fuzzy state, rather than being confined to capitals such as Washington, D.C. Most democratic countries now operate on versions of the "netocracy," or electronic democracy standard. This system allows constituents to voice their opinion and vote on every issue. The netocracy antiquated the traditional three-party political system and relies solely on electronic interaction.

MNCs also gain influence, profiting from the proliferation in commercially derived, advanced technology. Nation-states cannot control the transfer of wealth and information among internal and external groups, and as a result, state sovereignty declines.²⁹ However, people still look to their national government and military to provide national security and ensure conditions conducive to economic prosperity.³⁰

The Nature of International Politics

Global instability increases as the threat of WMD holds under-protected information systems and populations at

risk.³¹ However, nuclear WMD are not the primary problem in *Digital Cacophony*. The primary problems are the traditional "poor man's nuclear weapons," chemical and biological toxins, which are readily produced in this world. Information nets are also vulnerable to weapons of mass *disruption* (sometimes called WMD).

Cross-linked alliances, nation-state combines, religious factions, MNCs, or other actors multiply in an attempt to enhance security against numerous threats. Paradoxically, these multilayered links combine with economic interdependencies to create complex and unexpected interactions with outcomes no one can predict, effectively making the world more dangerous.³² The growing power of individuals and groups (reflecting the dispersal of power in *Digital Cacophony*), along with increasing population pressures, increases the number of conflicts. Every minor conflict has the potential to explode into a major regional war with the use of WMD and information disruption weapons. Millions have already died as a consequence of biological and chemical attacks.

The roles of governmental and nongovernmental organizations are constantly changing, and their power has decreased drastically. As governments focus on regional and global conflicts, nongovernmental organizations (NGO) must increase their role in disaster relief operations. The UN disintegrated due to its inability to resolve massive immigration attempts and numerous regional and global conflicts.³³ There is no nation-state left with the power to control world events, leaving bilateral and multilateral security arrangements which shift constantly as actors try to keep pace with changing threats. NATO still exists, but has become trivial, relegated primarily to the role of a legal secretary between countries negotiating security arrangements.

The Nature of US National Security Strategy

The US national security strategy in *Digital Cacophony* is two-fold; first, to deter and defend against hostile actions against US citizens, companies, and property, to include the use of WMD; and second, to ensure open electronic information flows. Most Americans have strong ties and interests around

the globe via information networks. These interests are often targeted by terrorists; and US citizens feel the military should protect these interests, whether they be goods, services, equipment, territory, or personnel. The military is equipped to meet all known contingencies at any location worldwide. They are directed to deter WMD through aggressive counterdetection, counterterrorism, and counterproliferation strategies.³⁴ The national security strategy also addresses the enforcement of free and open electronic trade throughout all nations and groups. The military is well trained and specially equipped for this mission and constantly monitors nearly all information networks.

The Nature of Humanity

In this world, individuals can hold great power and are able to affect the outcome of a great many things. However, they are only independent as a single entity on the Internet, as they are totally reliant on the net to function. Despite the allure of the electronic faux-life, a common dream is to "unplug" and be left alone for awhile . . . but the thought of missing the latest info-update is too enervating. Psychologists have categorized this neurosis as "infoleptis," a condition of frequent and uncontrollable desire for information.³⁵ People communicate freely on the net, but many have also become isolationists, unable to communicate face-to-face. The net has become the center of people's existence. "Net-vangelism," or internet evangelism, has become a dominant form of persuasion, competing equally with other media forms. It is often used to sway public opinion regarding proposed government policies.

Due to the rapidly changing political and technological environment, most people suffer from high levels of anxiety. Many cannot cope or are uncomfortable with Exponentialⁿ change and its apparently unknowable impacts. Sometimes even those comfortable with technology find themselves temporarily on the outside looking in. For example, disgruntled software engineers who are replaced by artificial intelligence are able to temporarily disrupt portions of the information net, causing havoc in the transportation network.³⁶

The Nature of Technology

Exponentialⁿ Δ TeK is the key driver in this world, accelerating beyond the control of world actors. Technological advances often result in unintended consequences, such as ready access to weapons of mass *disruption*. In a society dependent on the global network, a disruption to that service is often more damaging than a physical attack.³⁷

Information is a prized commodity, often used to barter, as normal power structures have become diluted. In particular, the filtering and sifting of information becomes the focus of almost every organization and individual.³⁸ Information equals power and control, but the main information challenge is sifting through databases to clear contaminants and waste by-products, such as unwanted and unneeded information. Personalized, self-adapting information filters are at the forefront of market demand. Filters also guard against "cyberagents," who prowl the net. Cyberagents infiltrate deep into cyberspace to detect, alter, steal, and destroy information filters and files. Since filters cannot protect against, nor detect, all "tainted" or false information, individuals have lost confidence in the information they are receiving.³⁹

Customers force innovations in a bottom-up research and development era, and companies must remain adept at satisfying individual customer needs. Some of the most significant advances have been in the medical field.⁴⁰ For example, most known diseases are detected and treated at birth; anti-aging products and services ensure a life expectancy exceeding 100 years of age; and genetic mapping allows researchers to examine the underlying causes of disease.⁴¹ Organ replacements are now performed as outpatient surgery, with a seven-to-ten day recovery time. Limb replacement patients complete rehabilitation in four to six weeks. These and other medical advances help sustain a high military operations tempo, as damaged soldiers can often be healed and recycled to the zone of operations in days. Nonmedical advances include the development of new super materials designed at the molecular level,⁴² miniaturization of most hardware devices,⁴³ and robots for most domestic and manufacturing tasks.⁴⁴ The military relies heavily on advances

in civilian technologies rather than funding their own niche research,⁴⁵ and quickly adapts and incorporates any new technology to keep ahead of the competition.

Since personal residences are the focus of all day-to-day activities, most services are provided directly to the home. For instance, quality primary and secondary education is available on the net.⁴⁶ This "democratization" of education has brought the world computer literacy rate to over 90 percent, and most individuals have college-equivalent degrees. Because interconnectivity is total and virtual, information technology is used for more than just power; it is also used for pleasure and intellectual fulfillment. For example, due to personal safety concerns, the majority use "sensurround systems" to enjoy sporting activities, or take vacations in the safety and comfort of their biologically filtered domicile. Sensurround is a series of biochemical and electronic systems providing a total virtual firsthand experience, more stimulating than life itself. Sensors are strapped onto the body and one can actually feel what is happening on the sport fields or while skiing the Alps, switching "locations" at a whim.

The Nature of the Environment

The rampant nature of Δ TeK leads to unintended chaotic effects in *Digital Cacophony*. A major concern is managing the unanticipated outgrowth of problems and unforeseen vectors spun off by the rapid and revolutionary leaps in technology. Consequently, this world is characterized as a "256-color" world; parts are green, parts are brown, and other "colors" just splash across the canvas. There are too many colors, and most are artificial. Also, everyone has a voice in this world, and it is difficult to find peace and quiet with those voices coming at you from every direction.

Unanticipated problems are an unfortunate outgrowth from this world, and controls are often not established in a timely manner commensurate with the dangers of technological developments. For instance, easy access to technology and materials caused a rapid spread of WMD. Another unintended consequence was when biogenetic diseases, developed for military and commercial use, escaped to the open environment.

Information weapons of mass disruption also exist, and filter industries must devote ever greater resources to the problem of viruses that have escaped from information warfare centers.⁴⁷ Some viruses evolve and are rarely detectable, existing as “stealth” viruses of unknown motivation, origin, or destination.⁴⁸

The terrorist threat has reversed the trend towards urbanization as people have scattered across the globe. Technology makes living just about anywhere feasible. Many live underground for additional protection and environmental aesthetics. Underwater settlements are beginning to flourish in support of the various mining operations and food production sites.⁴⁹

Technology has made great leaps in the day-to-day care of the environment. All trash is recycled and industrial waste has almost been eliminated.⁵⁰ Water is also recycled worldwide,⁵¹ while air and water filters keep home dwellings safe. People and animals suffer from organ failure due to the extreme electromagnetic radiation from the numerous electronic devices,⁵² but medical advances have made this problem treatable. Energy resources are plentiful, with substantial reliance on renewable resources such as wind, solar,⁵³ tidal, and wave energy,⁵⁴ as well as the expanded use of nuclear fusion.⁵⁵

The Nature of the Defense Budget

Technological advances have accelerated the growth of gross domestic products worldwide. For instance, the US GDP has risen an average of 6 percent annually over the past 30 years to \$39 trillion.⁵⁶ Accordingly, the federal budget has easily been able to withstand a rise in defense spending to more than \$300 billion in 1995 dollars (see fig. 5-3), an amount that represents less than 1 percent of American GDP. Military budgets—particularly for modernization, which is now 60 percent of the total DOD budget—rise in an attempt to stay apace with threats. Obsolescence is a recurrent problem, and some systems’ lifespans are measured in months or less. Though the defense budget has increased, serious threats from all directions, because of ready access to WMD and

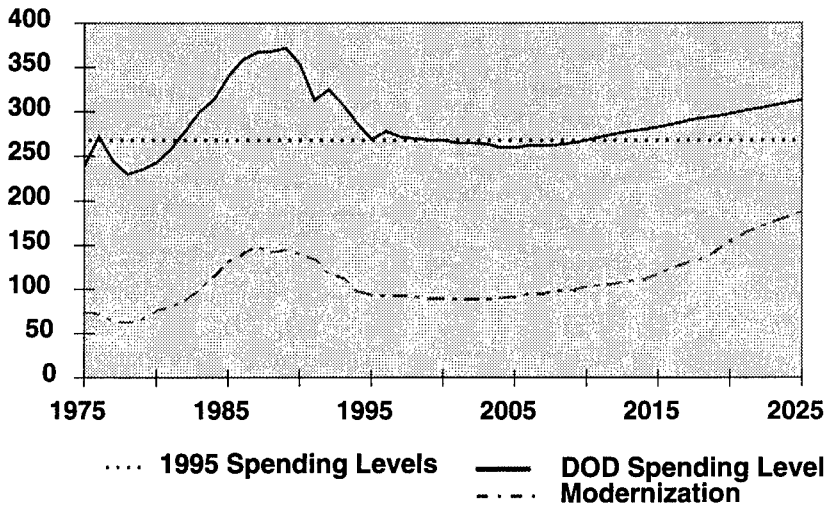


Figure 5-3. DOD Budget (Constant FY95 \$B) for *Digital Cacophony*

information disruption systems, reduce the overall security of US citizens.

Capabilities

America's global worldview supports a technically proficient military, able to inject itself into surface, spatial, and virtual operating environments. The US has chosen to be involved globally because the fuzzy state has, in a sense, formed a fluid continuum seeping into all of the world's nooks and crannies. The US perceives this continuum as a global neighborhood sharing one backyard,⁵⁷ one that must be made safe to prevent crises from propagating in unforeseen ways. To protect this backyard, forces must be adept at fighting in conventional, unconventional, and info-war environments. They must exploit advanced detection capabilities to locate and disarm both physical and virtual weapons. Fortunately, a small engagement force is generally sufficient to deter or resolve most situations. These small teams exhibit specialized training, with each individual proficient in tasks ranging from hostage negotiations to nuclear weapon disarmament. Multifunctional equipment, easily adaptable to varied

environmental conditions, is also required. Advance reconnaissance, detection, and communication assets are key to directing both teams and equipment.

Two other areas of primary concern for the military are modernization and defense. Modernization is never-ending in the face of proliferation of technology, and intense training is required to maintain forces at a high state of readiness.⁵⁸ Physical and virtual defenses are everywhere.

Implications

In *Digital Cacophony*, Δ TeK's Exponentialⁿ growth has contributed to an unstable world, domestically and internationally. The proliferation of mass destruction and disruption weapons keeps the world on edge. As fears in the US escalate, individuals turn to the netocracy in dictating what military action they want accomplished. At times it is not clear who the enemy is with the rapid shifting of coalitions. Historical allies become foes and foes become allies as technology quickly determines who is currently leading the technology race and receiving the profits.

Four main concerns impact the day-to-day operations of the military: time, modernization, training, and burnout. Time is of the essence as every conflict, no matter its initial scope, has the capacity to explode into regional or global war. The decision cycle is compressed into hours, vice days or weeks. To remain ready, the military maintains worldwide vigilance. The pace of modernization is driven by the need to stay ahead in fielding the latest weapon or countermeasure. Unfortunately, the pace of modernization makes it difficult to keep personnel trained in the latest techniques and equipment. A combination of extremely high operations and training tempo causes rapid burnout of most front-line military forces. Most remain in the field only 5 to 10 years. A key challenge is the task of balancing this burnout with the need to retain individuals with "live" experience.

Information-age advances have greatly benefited certain aspects of the military. Since many military missions can be performed "over the net," many serve "on-line." All headquarters and command functions are performed on-line

from dispersed locations to reduce vulnerability and increase efficiency. Many nonmobile functions, such as acquisition, supply, and most logistics, are transitioned to the reserves. All officer and enlisted professional military education and advanced technical training is individualized, and most student interaction is conducted via virtual videoconferencing seminars.

Summary

Digital Cacophony is a world racing to keep pace with the rampant speed of technological change. This condition results from the effects of Δ TeK being at the extreme Exponentialⁿ dimension. The power grid in this world has become Dispersed, and no one actor or government can control the free-flowing information across boundaries. The American worldview is Global due to the numerous threats facing the country and world. The US realizes it is part of the "global village" and must be involved worldwide to guarantee long-term security.

Notes

1. "One group of scientists has said the rate of change in our contemporary world is running a million times faster than the rate of humans' ability to adjust to the new situation." Michel Marriott, "In a Cashless Future, Robots Will Cook," *The New York Times*, 24 January 1996, C-1.

2. The concept is similar to a fictional example found in Bruce Sterling, *Islands in the Net* (New York: Ace Books, 1988).

3. Negroponte discusses the upcoming ability to carry "more and more computing and communications equipment on our body," with the wrist-watch being the most obvious choice. He predicts that within five years, one of the largest growth areas in consumer products will be with devices such as an all-in-one, wrist-mounted TV, computer, and telephone. Nicholas Negroponte, *Being Digital* (New York: Vintage Books, 1995), 210.

4. "It's a typical day in the year 2006. After a hectic afternoon of negotiating contracts with business partners in Hong Kong, London, Moscow, and the Bronx, you step into your kitchen. What's for lunch? You press a hand on your personal diagnostic machine, and quicker than you can say Michael Jackson does Sinatra, the unit checks your blood pressure, cholesterol and weight-fat ratio and reads out your nutritional requirements. Up pops the menus." Marriott, C-1.

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5. Julian dates are the days of a calendar year, numbered 1 through 365 (or 366 for leap year) starting with January 1st as 001. Months are not used.

6. Some of the **2025** advisors argued that such significant advances in technology would produce only a peaceful and nonthreatening world. They believed networking the world together would make people understand each other and be less confrontational. The Alternate Futures team feels technology will also produce negative effects. Often technology will come into the hands of those willing to do whatever it takes, whether positive or negative, to support their position.

7. Numerous sources cite the projected development of advances in the medical field. Robert Langer and Joseph P. Vacanti, "Artificial Organs," *Scientific American* 273, no. 3 (September 1995): 100-103; Jeffrey A. Fisher, "Breakthroughs in Sight," *World Health* 47, no. 5 (September-October 1995): 20-21; "In 2010," *The Economist* 330, no. 7855 (19 March 1994): F15-18; and Douglas E. Olesen, "The Top 10 Technologies, for the Next 10 Years," *The Futurist* 29, no. 5 (September-October 1995): 9-13.

8. Mr Edward Cornish, president of the World Future Society, predicts that "homes will be so comfortable and so wired to the outside world with communication and entertainment equipment that people will rarely want to leave them." Marriott.

9. Numerous references predict expansion of global networking. Mark Nollinger, "America, On-Line," *Wired* 3, no. 9 (September 1995): 158; and George I. Zysman, "Wireless Networks" and "Wireless Telephony for Developing Countries," *Scientific American* 273, no. 3 (September 1995): 52; and Marvin Cetron and Owen Davies, "50 Trends Shaping the World," adapted from *Crystal Globe: The Haves and Have-Nots of the New World Order* (Bethesda, Md.: St. Martin's Press, 1991), 1-10.

10. Walter B. Wriston, *The Twilight of Sovereignty: How the Information Revolution is Transforming Our World* (New York: Scribner Publishers, 1992), 1-176.

11. Here the Tofflers' concept of "hyper-connectivity" is extended further. The authors propose that the increased use of networking will allow average American citizens the capability to vote on every issue as opposed to sending forward a representative. Alvin Toffler and Heidi Toffler, *War and Anti-War* (Boston: Little, Brown, and Company, 1993), 244-246.

12. Negroponte states, "My guess is that 1 billion people will be connected (to the Internet) by the year 2000. This is based on the fact that the fastest growing number of Internet hosts (percent change) in the third quarter of 1994 were Argentina, Iran, Peru, Egypt, the Philippines, the Russian Federation, Slovenia, and Indonesia (in that order)." Negroponte, 182.

13. Researchers have shown a link between social unrest and poverty/economic growth. While social instability can and does affect the economy, this is the lesser of the two effects. Suk Hun Lee, "Relative Importance of Political Instability and Economic Variables on Perceived Country

Creditworthiness," *Journal of International Business Studies*, Winter 1993, 801-812. What is clear is that social unrest, caused by discovering that one is a have-not, can impact the economy of a region. Bedford N. Umez, "Has Social Mobilization Caused Political Instability in Africa? A Granger Causality Test," *The Review of Black Political Economy*, Summer 1993, 33-54.

14. "The threat of a Russian-American nuclear Armageddon may have lessened with the ending of the cold war, but fears about the spread of nuclear weapons have, if anything, intensified. 'The bomb' remains the power-symbol of choice, coveted by nervous governments around the world." "Nuclear Non-Proliferation: Between the Bomb and a Hard Place," *The Economist* 334, no. 7907 (25 March 1995): 23-25.

15. David Albright, president of the Institute of Science and International Security, describes how difficult it is detecting small, nuclear facilities. He states, "Although many secret programs have been detected and thwarted, several important programs have eluded detection. In some cases, the failure stemmed from inadequate monitoring; in others, from a lack of political commitment." David Albright, "A Proliferation Primer," *The Bulletin of the Atomic Scientists* 49, no. 5 (June 1993): 14-23.

16. "Genetic engineering has great potential in agriculture. By the turn of the century the world will be using crop products which have been honed to market specification by the addition, subtraction, or modification of genes." Jim Peacock, "Twenty-first Century Crops," *Nature* 357, no. 6377 (4 June 1992): 358. Other related articles describing genetic engineering of plants include: "A Swift, Simple Way to Engineer New Plants," *Business Week*, no. 3368 (25 April 1994): 136; "Pest-Resistant Seeds Foil Insects," *USA Today* (Magazine) 123, no. 2601 (June 1995): 14-15; and "Creating Shorter, Stronger Plants," *USA Today* (Magazine) 122, no. 2589 (June 1994): 7-8. For information on genetic engineering of animals see Jacqueline M. Graves, "Designer Genes Go for Your Plate," *Fortune* 132, no. 1 (10 July 1995): 22; Hayo Cremers and Debora MacKenzie, "Europe Wrangles over Herman's Sex Life," *New Scientist* 136, no. 1849 (28 November 1992): 8; and Diane Gershon, "Genetically Engineered Foods Get Green Light," *Nature* 357, no. 6377 (4 June 1992): 352.

17. "The influenza virus is unique among viruses in being able to undergo so much antigenic change that an antigenically novel virus can sweep around the world in a year or two, giving rise to significant morbidity and mortality. . . . Recent and historical information suggest China, especially southern China, as a hypothetical influenza epicenter." Kennedy F. Shortridge, "The Next Pandemic Influenza Virus?" *The Lancet* 346, no. 8984 (4 November 1995): 1210-1212. In addition, a very realistic plague situation is played out in "Savior of the Plague Years," *Wired Scenarios, Special Edition*, 1.01 (1995): 84.

18. A similar influenza pandemic occurred in the past. "It was a secondary bacterial infection that accounted for the high mortality in the influenza epidemic of 1918 and 1919, one of the worst human catastrophes on record. It has been estimated that more than 20 million people around

the world died during the epidemic, and of the 20 million people who suffered from the illness in the United States, approximately 850,000 died." *The New Encyclopedia Britannica*, 15th ed., 1991, vol. 26, Macropeadia, 748(2)a.

19. In 1995, "ninety-five percent of the wild rabbits in South Australia were killed by the accidental release of the deadly calcivirus" in less than three months. Such accidents cause great fear in *Digital Cacophony*, a world where information is available at the lowest level, without the infrastructure to institute rigorous safeguards. Steve Newman, "Rabbit Viruses," *The Atlanta Journal-Constitution*, 3 February 1996.

20. The Tofflers assert that unless the UN is reorganized, it will lose all its efficacy and relevance. In this world, it fails to reorganize, thus in effect disbands as the major powers in the world discontinue their membership. Toffler and Toffler, 210.

21. "A HERF gun is a very powerful weapon in the Information Warrior's arsenal, and it can come in all sorts of different configurations to meet one's needs. At a very basic level, a HERF gun shoots a high power radio signal at an electronic target and puts it out of commission." Winn Schwartzau, *Information Warfare* (New York: Thunder's Mouth Press, 1994), 178.

22. Don White, an expert on electromagnetic shielding, "feels that HERF represents a real challenge for the commercial sector, especially if used by terrorists. He agrees that HERF, since it is both invisible and insidious, is a much-overlooked threat." Schwartzau, 183-184.

23. In the 1990s, Gen Donald J. Kutyna, while commander in chief of the US Space Command, testified before the Senate Armed Services Committee about the ever-increasing threat of third world tactical ballistic missile systems. In *Digital Cacophony*, ballistic missile technology has merged with precision instrumentation, giving so-called third world countries the capability to achieve some nuclear effects with nonnuclear devices. Maj James P. Marshall, "Near Real-Time Intelligence of the Tactical Battlefield," Maj Glenn Cobb, ed., *Theater Air Campaign Studies Course Book* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 231-238.

24. A territorial war breaks out in North Africa between Libya and Algeria. Libya claims the war is based on an old territorial dispute with Algeria, but both countries are really vying for the rich natural resources in Tunisia. As the tide turns towards an Algerian victory, Libya launches a Scud missile with a small nuclear warhead at the city of Algiers. This is a fictional scenario based on information gathered in *Jane's Sentinel: The Unfair Advantage, Regional Security Assessment, North Africa, 1995 Edition*, ed. by Paul Beaver (Surrey, UK: Jane's Information Group, 1994).

25. "Space is limitless in every sense. If we are to survive and progress as a species, then we must eventually break through the limits of our home planet and people the reaches of space." For additional info see Marshall T. Savage, "Dawn of a New Millennium," *Ad Astra* 7, no. 4 (July/August 1995): 40-43.

26. "Space will undoubtedly be a center of gravity in any future war with a peer. Space offers a medium for near instantaneous, cheap, worldwide communications [and] continuous surveillance . . . these are war-deciding capabilities . . . war in space will mirror any other kind of war. It will have offensive and defensive aspects. Militaries will attack enemy satellites while trying to defend their own satellites." Jeffery R. Barnett, *Future War* (Maxwell AFB, Ala.: Air University Press, 1996), 41; and Toffler and Toffler, 99–101.

27. The oceans have vast reserves of commercially valuable minerals, including nickel, iron, manganese, copper, and cobalt. These minerals are found most often near hot gushers, known as hydrothermal vents, spewing up a black cloud of superheated, mineral-rich water from an average depth of about 7,300 feet. Several mining companies are drawing up plans to investigate further. Michael D. Lemonick, "The Last Frontier," *Time* 147, no. 7 (14 August 1995): 54–60; and Steven Ashley, "Voyage to the Bottom of the Sea," *Technology Review* 97, no. 3 (May/June 1994): 13–14. As for ocean settlements, Marshall Savage, author of *The Millennial Project*, states the colonizing of the earth's oceans are the first phase of space colonization. The oceans are vast, with warm water banks of energy and nutrients sufficient to provide a very large population with a high standard of living on an indefinitely sustainable basis. For additional information see Savage, 40–43. One of the **2025** advisors asked during the 7 February 1996 briefing of the Alternate Futures why people would want to live in space or under the sea. John Mauldin put it best when he said, "People will go to the stars for the basic reason that some yearn enough to endure and overcome the hardships." John H. Mauldin, "Reflections on the Sociology of Interstellar Travel," *Ad Astra* 7, no. 4 (July/August 1995): 48–52.

28. Negroponte feels that as the business world globalizes, along with the Internet, one will start to see "a seamless digital workplace." Bits will be borderless, stored and manipulated with absolutely no respect to geopolitical boundaries. Negroponte, 228. Also see Marriott; and Bill Gates, *The Road Ahead* (New York: Viking, 1995), 231–242.

29. Wriston.

30. The **2025** executive committee brought up the point during a videoteleconference on 10 January 1996 that as people's fear and anxiety rise, they would expect governments to do more to provide security, even if the government is "virtual."

31. Van Creveld points out that historically, nuclear WMD have not conferred any particular military or political advantage to their possessors, who incur debilitating financial and technical strains in producing and maintaining such systems. See Martin van Creveld, *The Transformation of War* (New York: The Free Press, 1991), 2–10. The Alternate Futures study team asserts that in a world of rampant Δ TeK, the entry fee would be substantially reduced. However, nuclear WMD are not the primary problem in *Digital Cacophony*. The primary problems are the traditional poor man's nuclear weapons—chemical and biological toxins—which are readily produced

in this world. Information nets are also vulnerable to weapons of mass disruption (sometimes called WMD).

32. Even strong advocates of the merits of interdependence, such as Joseph Nye, now acknowledge that "the growing interdependence of the world does not necessarily establish greater harmony." Joseph S. Nye and William A. Owens, "America's Information Edge," *Foreign Affairs* 75, no. 2 (March-April 1996): 24; and Toffler and Toffler, 175.

33. The Tofflers assert that unless the UN is reorganized, it will lose all its efficacy and relevance. What will remain is a hollow shell, a country club of nation-states who debate the good old days. Toffler and Toffler, 210.

34. Nye and Owens argue that information dominance in battle has the ability to deter twists of terror and propaganda. Nye, 25.

35. This definition is patterned after that for narcolepsy. It is a logical extension of articles in the 1990s that discuss Internet addiction. These cybernauts, lost in electronic space, would constitute a large portion of *Digital Cacophony* denizens. For a sample article see Diedra Henderson, "Addicted to the Internet," *The Atlanta Journal-Constitution*, 24 March 1996. For a fictional example of the effects of being left off the net, see Sterling.

36. Schwartau cites numerous examples of people manipulating systems as an act of revenge or for personal gratification. Schwartau, 215-248.

37. "Information warfare is an invisible but very real war where Information Weapons of Mass Destruction are let loose, either in a focused way, to achieve specific results, or indiscriminately, to have the widest possible impact. The victims are not only the targeted computers, companies, or economics, but the tens of millions of people who depend upon these information systems for their survival." Schwartau, 291; "Tomorrow's terrorist may be able to do more damage with a keyboard than with a bomb." Toffler and Toffler, 150.

38. "Information overload is not unique to the highway. . . . you'll be able to set up 'filters' which are really just standing queries. Filters will work around the clock, watching for new information that matches an interest of yours, filtering out everything else." Gates, 79-80.

39. Schwartau, 1-384; and Douglas Waller, "Onward Cyber Soldiers," *Time* 146, no. 8 (21 August 1995): 38-42.

40. "The Future of Medicine," *The Economist* 330, no. 7855 (19 March 1994): F3-18; John Carey, "Science-Fiction Medicine Is Fast Becoming Fact," *Business Week*, no. 3399 (18 November 1994): 169; Thomas Blanton and David C. Balch, "Telemedicine," *The Futurist* 29, no. 5 (September-October 1995): 14-18; Fisher, 20-21; Langer, 100-103; and Olesen, 10.

41. Olesen, 10.

42. *Ibid.*, 10.

43. Charles Platt, "The Museum of Nanotechnology: Tiny and Great Leaps for the Human Race," *Wired Scenarios, Special Edition* 1.01 (1995): 102-103.

44. Hans Moravac, professor at Carnegie Mellon University's Robotics Institute, foresees that by 2000, robots able to find their way around open

and cluttered places without using markers or devices to assist, plus being more cost effective than a person. Charles Platt, "Super Humanism," *Wired* 3, no. 10 (October 1995), 144; and Negroponte, 213.

45. Admiral Owens, vice chairman of the Joint Chiefs of Staff, noted that even in 1995 the center of technological acceleration generally lay in the commercial, nondefense sector. William A. Owens, "The Emerging System of Systems," in Maj Glenn Cobb, ed., *Theater Air Campaign Studies* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 205-209.

46. "The information highway will help raise the educational standards for everyone in future generations. The highway will allow new methods of teaching and much more choice." Gates, 198.

47. Schwartau, 105-108; and Waller, 38-42.

48. Toffler and Toffler, 150-151.

49. "The Next Wave: Aquaculture," *Scientific American* 273, no. 3 (September 1995), 185. Also see Lemonick, 54-60; Steven Ashley, 13-14; and Savage, 40-43.

50. The growing trend is for industries to now "design for recycling," "design for disassembly," and "design for the environment." There is a shift away from the treatment or disposal of industrial waste and towards the elimination of its very creation. Manufacturers will design and produce products in such a way as to make the control of waste and pollution part of their enterprise, not just an afterthought. See Robert A. Frosch, "The Industrial Ecology of the 21st Century," *Scientific American* 273, no. 3 (September 1995), 178-180; Julian Szekely and Gerardo Trapaga, "From Villain To Hero (Materials Industry's Waste Recovery Efforts)," *Technology Review* 98, no. 1 (January 1995), 30-36; "Garbage In, Business Out," *The Economist* 337, no. 7938 (28 October 1995), 94; and Michael Terrazas, "Report Outlines Global Waste Reduction Efforts," *American City & County* 110, no. 10 (September 1995), 16-19.

51. Around the world, and most especially in water-short countries, states, and cities, wastewater is meeting a variety of demands. These range from water reuse for agriculture, industry, urban reuse and irrigation, environmental and recreational application, groundwater recharge, and augmentation of potable water supply. John Meister, "Waste Not, Want Not: Putting Wastewater To Work," *American City & County* 110, no. 1 (January 1995), 32; and "Reclaimed Water Requires Homework First," *American City & County* 110, no. 11 (October 1995), 34.

52. Similar to the scenario portrayed in the movie *Johnny Mnemonic*.

53. "By 2025 the worldwide demand for fuel is projected to increase by 30 percent and that for electricity by 265 percent. Even with more efficient use and conservation, new sources of energy will be required. Solar energy could provide 60 percent of the electricity and as much as 40 percent of the fuel." William Hoagland, "Solar Energy," *Scientific American* 273, no. 3 (September 1995), 136-139; and Cetron and Davies, 4.

54. Jeremy Webb, "Wave Energy Project Hangs in the Balance," *New Scientist* 140, no. 1896 (23 October 1993), 8; David Ross, "Not Drowning

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But Waving," *New Statesman & Society* 9, no. 385 (12 January 1996), 30; Jeremy Webb, "Tide of Optimism Ebbs Over Underwater Windmill," *New Scientist* 138, no. 1870 (24 April 1993), 10.

55. Harold P. Furth, "Fusion," *Scientific American* 273, no. 3 (September 1995), 141-143.

56. Based on a 1995 US GDP of \$6.74 trillion. *The World Fact Book* (Washington, D.C.: Central Intelligence Agency, 1995), 144.

57. Karl Magyar suspects that this alternate future might evolve into a fuzzy global body politic. In such a world, cooperation and consensus would strongly influence (though not necessarily determine) interactions between actors. Dr Karl Magyar, faculty, Air Command and Staff College, Maxwell AFB, Ala., interview with one of the authors, 9 April 1996.

58. In a world in which forces are constantly deployed, it becomes difficult to find the time to train for those missions. This problem is exacerbated in *Digital Cacophony*, where military members must not only train for a mission type, but must frequently retrain with new equipment. Standardization between upgrades and outright replacement of equipment ease the burden. Joint Pub 1, *Joint Warfare of the US Armed Forces* (Washington, D.C.: US Government Printing Office, 1991), 3.

Chapter 6

King Khan



While the twentieth century has been called the American century,¹ the world of *King Khan* has seen the dawning of what appears to be the Asian Millennium. The United States is beset by economic problems; the American worldview is clearly Domestic (fig. 6-1).

Technological advances are at the slowest rate of the six worlds, because most of the world's economies are unable to sustain significant investment in research and development. The one economy that can support such an effort, Khan, is primarily concerned with infrastructure improvements. Δ TeK is highly Constrained. The World Power Grid is Concentrated and dominated by the Asian colossus. Its member states, China, Hong Kong, Singapore, Mongolia, Taiwan, Malaysia, and Indonesia, comprise the world's only superpower.² The evolution of this world seems sudden to its residents, yet the chain of events that led to this conclusion began long ago.

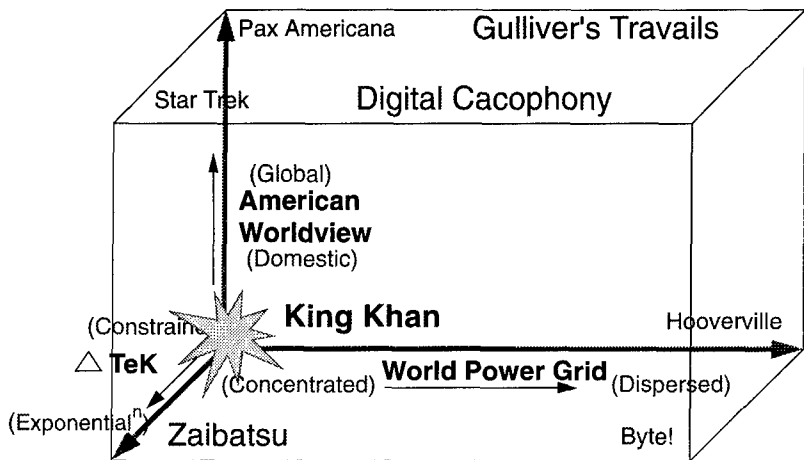


Figure 6-1. Strategic Planning Space for *King Khan*

Plausible History

The sequence of events commenced in 1994 when the governors of Texas and California complained to the federal government in Washington that the flood of illegal immigration had to be stopped (fig. 6-2). The illegal immigrants nearly bankrupted California. As a result the governor lobbied for

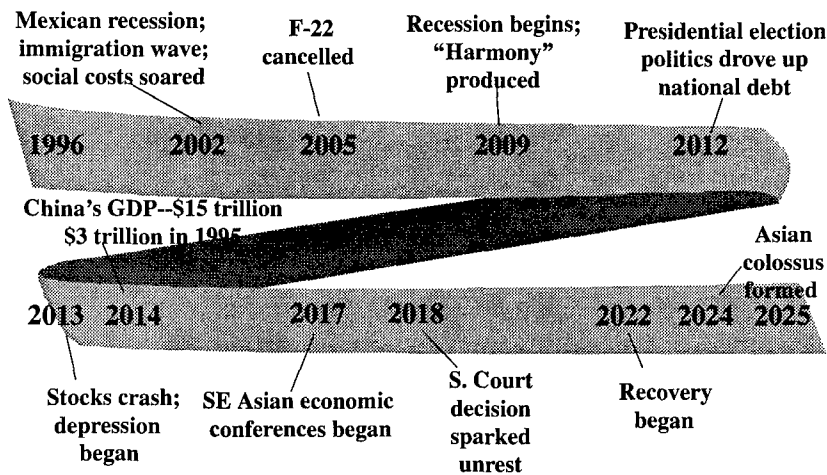


Figure 6-2. Plausible History for *King Khan*

passage of Proposition 187, which would have denied all welfare and social benefits to non-US citizens. Supported by 58.8 percent of the California electorate,³ the proposition passed, only to be struck down in federal court.⁴ The case was appealed,⁵ and after much debate, the Supreme Court finally ruled that all illegal immigrants were entitled to welfare.⁶

The Mexican recession of 2002 produced an immigration tsunami across US borders, driving social spending out of control. This sent federal budget deficits soaring and led to the cancellation of numerous programs, including the F-22 program in 2005.⁷

By this time, social scientists were well aware that much of the national wealth of Singapore, Taiwan, Indonesia, and Malaysia resided in the hands of ethnic Chinese.⁸ Yet when these four nations joined with China to jointly produce the "Harmony" fighter in 2009,⁹ based on the designs of the canceled F-22, the US government reacted with surprise. No substantive American reaction was possible. US budget deficits had risen so high and federal borrowing was so extensive that a serious recession began that year.

The Korean governments were also surprised by the Harmony fighter production plans. Fears ignited by the collaboration between the other Asian powers sparked discussions which led to the peaceful reunification of the Korean peninsula in 2011.

In the run-up to the 2012 presidential election, the incumbent US leadership tried to prime the economy with a federal spending surge. The attempt failed. The federal debt hit \$10 trillion in early 2013, and on 2 July the stock market crashed and a depression began.¹⁰ While Europe was affected, Southeast Asia was such a large creditor region they escaped relatively unscathed. China's gross domestic product passed \$15 trillion in 2014,¹¹ the same year the yuan became the de facto international currency standard.

In 2016, US unemployment reached 18 percent, and the government faced the "great dilemma": Should it allow banks to foreclose on homeowners, creating millions of new homeless people, or should it protect homeowners and risk bank failures?¹² It chose the latter. In the aftermath, over 10 thousand

banks failed and the government scrambled to keep the monetary system afloat.

Meanwhile, the Harmony project was a great success. An outstanding technical achievement, it sparked a desire for the Asian powers to work more closely together. They began annual economic conferences in 2017, at which time a framework for regional free trade was established.

In 2018 the United States Supreme Court reversed its 1990s immigration rulings, paving the way for a reduced federal budget. Riots resulted as non-US citizens violently protested the sudden loss of welfare and other social benefits. The National Guard had to be mobilized to quell the disturbances. Over the next four years, the Congress and the president completely streamlined and restructured the Washington bureaucracy. The financial markets began to react positively, and in 2022 the economic recovery began.

At the same time, Taiwan and China set aside their past differences and merged peacefully. Following that merger, Singapore, Malaysia, and Indonesia began to push for economic unification with China. Beijing hosted a conference in 2023 where a series of agreements were signed leading to the formation of a new confederation. In 2024 China, Singapore, Malaysia, and Indonesia merged into the largest economic power the world has ever known.

The Nature of Actors

The Khanian Confederation is the world's only superpower. Economically and militarily over six times the size of the United States,¹³ it dominates international relations. It is a commanding presence in global fora such as the United Nations and the G-8 (former G-7 plus Khan). Khan maintained its economic strength and its explosive growth during the years of the US depression, partly because many multinational corporations relocated to Khan where the taxes were lower and more business-friendly.

The United States remains a major actor in this world of 2025, but has become analogous to the United Kingdom of 1996. The US continues to have global trade interests but lacks the military power to unilaterally pursue these interests

when they conflict with Khan's. Further, America's continued economic recovery is dependent on access to major markets including Khan, Japan, and Russia.

Japan and Korea remain independent nations but are increasingly worried by Khan's growing economic and military might. Japan has become the "Taiwan" of 2025.

Some nongovernmental organizations are major actors in this world. Amnesty International and Greenpeace are actively trying to mitigate human rights violations and environmental damage. They concentrate their efforts on Khan but with limited success. Khan's economic development has spurred improvements in human rights issues, and most of the world believes Khan is "democratizing."¹⁴

The Nature of International Politics

The focal point of the World Power Grid, Khan has displaced the United States at the center of the international arena. Khan's rising standard of living and enormous population strains world oil and rare mineral production capacity. Khan has the power to ensure they and their closest trading partners, such as Southwest Asia, get more than their share of these resources. This leaves others with reduced access, including the United States.¹⁵

Fears of Khanian domination keep Russia, Japan, and India on edge. They attempt to balance Khan's superpower status by forming an alliance, but to be effective they need US support. Khan is more powerful than any of these nations but cannot counter all four simultaneously.

The United States has difficulty playing the role of the balancing power, because the average US citizen does not view Khan as a threat but rather as a supplier, a market, and a valued customer. Further, the United States needs access to both Khanian and Japanese markets to continue its economic recovery. As a result, the United States finds itself in a diplomatic high-wire act with no safety net.

Elsewhere, the international community continues to split along traditional North-South boundaries. The economic expansion of Khan and the economic recovery of the Western powers exacerbated economic disparities between North and

South. Parts of Latin America and much of Africa have been left behind.¹⁶ These “have-not” regions lack the economic or military clout necessary to effectively compete for the resources prerequisite to growth. The disparity between haves and have-nots is great, shows no signs of decreasing, and is an occasional source of heated debate in fora such as the UN.

The Nature of US National Security Strategy

The strategic challenge in *King Khan* is the emergence of the Asian colossus. Due to its recent economic problems and the corresponding decrease in military spending, the United States must ensure its national security through alliances. The US is not strong enough to act unilaterally; it must contain Khan’s expansionist tendencies through diplomacy.¹⁷ Finally, the United States has reverted to a strategy of Mutual Assured Destruction (MAD) as its ultimate means of ensuring national survival. Because of their low operations cost, the US has maintained some intercontinental ballistic missiles as its only means of nuclear deterrence.

The Nature of Humanity

In this world, average Americans find themselves struggling to maintain the basic necessities of life. Strong racial and ethnic tensions have emerged amidst this struggle as citizens compete for limited employment opportunities.

US citizens and businesses are also finding it difficult to adjust to the loss of superpower status.¹⁸ Americans are having to learn to cope in a world where their standard of living is no longer the highest, and several other countries are sustaining faster economic growth. Establishing alliances with people or governments in other countries has become difficult because Americans no longer exert the dominant influence in policy decisions. As a result, mastering other languages and cultures has become important to individual and corporate survival.¹⁹

The Nature of Technology

Technological development in this world occurs slowly. Δ TeK is Constrained due to the severe US economic problems and subsequent worldwide repercussions. Additionally, Khan's emphasis on raising the standard of living of its interior population has hindered research and development, as its funds were spent on developing infrastructure.²⁰ Fossil fuel-powered motorcycles, automobiles, trains, and planes still provide for most transportation. As a partial solution to its infrastructure problems, Khan developed ground-effect vehicles (GEV) which ride on a cushion of air over poor roads and small rivers.

In this world, the US has lost its edge in technology and can no longer use it to leverage capabilities against potential adversaries. Khan has not completely grasped the potential for Δ TeK leverage and thus is still relying on large conventional forces for its security. This flattening of the technological edge among nations leaves open an opportunity: the first nation with the leadership and resources to recognize and exploit the potential for renewed technological leverage will enhance its position relative to potential enemies. The US challenge is to identify those technologies or programs worth pursuing now that its economy is recovering.

The Nature of the Environment

Population pressures, economic competition, and inattention have led to great environmental damage. Clean drinking water is scarce and competition over water rights has become a source of conflict in Africa and Southwest Asia. Khan added 400 million refrigerators and 200 million air conditioners based on chloroflourocarbon (CFC) technology, which has decimated the ozone layer.²¹ Nuclear power production and the resulting waste storage problems have increased worldwide because Khan's increased fossil fuels consumption forced other nations to switch to alternate energy sources for electricity.²² Meanwhile, global warming caused by continued "greenhouse" pollutant emissions changed world weather patterns, creating severe droughts in Africa²³ and flooding in

the coastal regions of the world, such as India, Bangladesh, the Netherlands, and Florida.²⁴

Global food production has suffered as a result of climate changes, Khanian agricultural practices, and loss of low-lying lands.²⁵ Nations which can produce surplus food for export lack adequate distribution systems to transport that food to starving regions.²⁶ The UN is besieged with requests for help, but cannot act without granting favors to Khan, which suffers occasional food problems of its own.²⁷

The Nature of the Defense Budget

The American recession in 2009 and the depression which began in 2013 caused an increase in social programs and welfare spending. Combined with lower revenues, this left little for defense after 2010 (fig. 6-3). The modernization budget nearly ceased to exist. In 2022, the economy and DOD spending began to recover in the wake of government restructuring. The recovery was enhanced by lower social outlays following the Supreme Court decision to eliminate welfare for non-US citizens. Economic problems held the US to an average annual growth of 1.3 percent during the 30 years from 1996 to 2025. Extremely austere DOD budgets caused most force levels to be reduced by two-thirds during the period between 2010 and 2022. Consequently, the US could not

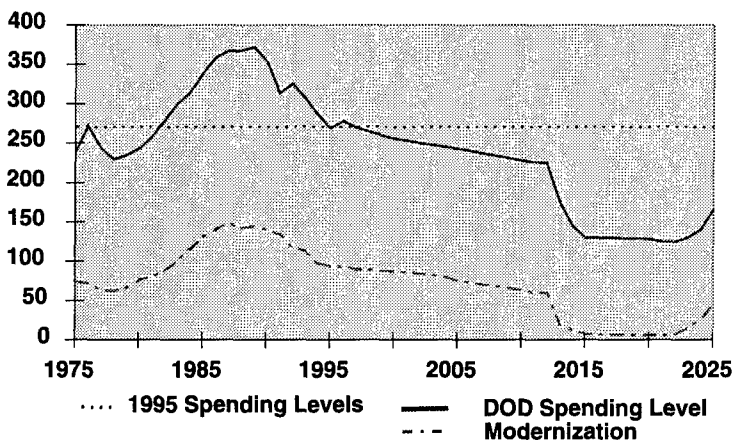


Figure 6-3. DOD Budget (Constant FY95 \$B) for *King Khan*

afford its overseas presence, and all ground forces were brought home. The US abandoned, and left to decay, all overseas fighter bases. DOD spending represents less than 1.5 percent of GDP by 2025.

Capabilities

In contrast to the United States, Khan can afford enormous military capabilities with a GDP estimated at over \$70 trillion (1995 dollars).²⁸ Even adherence to the Japanese model of capping military spending at 1 percent of GDP yields real Khanian defense expenditures at approximately three times the level of the United States in the mid-1990s. This gives Khan the ability to field a military twice the size of US forces during the height of the "Reagan buildup." As the United States emerges from its depression and seeks to resecure its position in this world, it will require several capabilities.

Because of Khan's numerical superiority, the United States will need to leverage technology to bridge the quantity gap. This may prove difficult, as United States research and development funding has slumped in recent years. The only affordable approach is through the exploitation of commercial technologies, but many commercial enterprises are now in Asia—giving Khan swifter, if not sole, access. While leveraging technology is difficult under these circumstances, it is necessary.

With the DOD budget cuts between 2010 and 2022, little was allocated for upgrades to space-based assets. As a result, the United States enters 2025 with an aging satellite fleet with reduced capabilities. Intelligence data in this world is crucial, and the United States needs alternate sources of information. Understanding Khan's plans is particularly important; therefore, insightful HUMINT is vital.

The United States needs an inexpensive deterrent strategy to check the colossus. Since it is unable to balance Khan with conventional forces, the US has revived the strategy of Mutual Assured Destruction.

A key to America's future is continued robust economic growth. In addition to the foreign relations aspects outlined above, the United States must engage in nation building at

home. The ability to conduct humanitarian operations on US shores was critical during the depression and remains important today, though to a lesser degree. Counterterrorism and antidrug efforts still occupy nearly half of the armed forces, though these numbers are decreasing.

The United States faces the monumental task of modernizing a force that in some areas is over 40 years old. The slow procurement rates between 1995 and 2010 resulted in the military's entering the depression with an already aged force. The lack of a domestic military industrial base means the United States must rely on foreign sources for substantial quantities of military hardware. On the plus side, foreign purchases enhance interoperability with potential allies. As the nation begins to reengage in the world, one of the most critical initial requirements is lift.

New doctrine and tactics are necessary to wage wars with nations better armed than ourselves. The National War College has engaged in studies to develop tactics based on *mujahadeen* operations. The ability to wage war with greatly outmatched forces is now a requirement in a world where the United States is no longer a superpower.

Implications

The 2025 world of *King Khan* holds many implications for the United States. Among the most significant and obvious are the issues of how a nation downsizes, restructures, and then reconstitutes its forces in a world economically and militarily dominated by a super-peer competitor. The prioritization of the reconstitution process, access to resources, and the decision whether to compete with the Asian colossus are all difficult military and political issues. The military must adjust to its new position in national security strategy.

As a potentially hegemonic Asian superpower, Khan greatly affects regional and global stability. India, Korea, Russia, and Japan constantly worry about the sanctity of their borders in the face of Khanian hordes. Khan will probably develop the need for new territory as it strains world mineral and food resources further.

Despite its economically forced Domestic worldview, the United States faces a difficult external policy dilemma, and so it unites with Japan, India, and Russia to form an informal counterbalancing alliance to restrain Khan. The United States is considered to be the linchpin to the alliance. The United States, however, places enormous value on good relations with Khan, in part due to their enormous military and economic might. The US cannot compete with the Asian colossus, and thus US relations with Khan are the centerpiece of national security strategy. In spite of this, Japan's trade is still sufficiently important to the recovering US economy such that the defense commitment to them remains. Balancing relations on both sides of this equation is precarious.

Social forces are affecting the military reconstitution, mobilization, and modernization efforts currently under way. Budget cuts have produced a small active duty force, but there is a large recruiting pool available. Many people need jobs, and major ethnic groups are demanding that a large portion of the military recruits be minorities.

Establishing military budget priorities is a difficult problem. The active duty force is heavily involved in training the new personnel, and these training costs must be balanced against the current operations and procurement budgets, both of which need vast infusions of funds. The anemic economy cannot yet sustain a return to large deficits or major tax increases to support a military buildup.

Summary

The world of *King Khan* presents the challenge of a super-peer competitor in East Asia. Operating in this alternate future poses great challenges for the United States in the economic, diplomatic, informational, and military arenas. This is a world where the American worldview is Domestic, Δ TeK is Constrained, and the World Power Grid is Concentrated.

Notes

1. This term was used by Dr Walter LeFeber as both the title and theme of his book *The American Century: American Foreign Policy Since the 1890s*, and is referred to in a later work, *The American Age: United States Foreign*

Policy at Home and Abroad Since 1750 (New York: W. W. Norton Publishing Co., 1989), 759.

2. While this study postulates a greater Asian superpower, the Naval War College and the CIA have also postulated the emergence of China as a superpower. These organizations have used an emergent China as a foe in wargaming for the past three years. The war games simulate a Sino-American conflict for either the year 2005 or 2010 using forces projected to exist by US intelligence. Since the beginning of 1994, China has won in each scenario. For details, see Joffe Ellis, "The PLA and the Chinese Economy," *Survival*, Summer 1995, 25-43; and Daniel E. Eldridge, "China's Economic Reform and Military Modernization" (Air War College regional studies paper, Air University, Maxwell AFB, Ala., 20 February 1996). For another recognition of the increasing dominance of Asia, see Richard Halloran, "The Rising East," *Foreign Policy*, Spring 1996, 3-21.

3. Election returns in November 1994 showed 58.8 percent of the California electorate voted for the proposition, with 41.2 percent opposed. Full returns from this election are available on the Internet at <http://ca94.election.digital.com/e/returns/prop/page.html/#prop-187>.

4. The Federal District Court of California issued a ruling against Proposition 187 on 27 November 1995. Details on this ruling by Judge Pfaelzer are available through the Internet at <http://www-paradigm.asucla.ucla.edu/DB/Issues/95/11.27/news.prop187.html>.

5. An appeal of this case has been filed with the 9th Circuit Court of Appeals. Ibid.

6. The Supreme Court will likely hear the case after the ruling by the 9th Circuit Court of Appeals. It is expected to rule based on the precedent set in the 1982 case of *Plyer versus Doe*. In this Texas case, the court ruled that illegal immigrants were entitled to state-funded social services, such as education. See Internet: <http://www-paradigm.asucla.ucla.edu/DB/Issues/95/11.27/news.prop187.html>.

7. This event does not reflect the views or priorities of the AF leadership. This event exists in this scenario for heuristic reasons.

8. Large amounts of ethnic Chinese populate these countries. For specifics, see Brian Hook and Denis Twitchett, *The Cambridge Encyclopedia of China* (Cambridge, England: Cambridge University Press, 1991), 86. Further, most of China's economic growth has been sponsored by ethnic Chinese outside the mainland: Abu Selimuddin, "China: The Biggest Dragon of All?" *USA Today*, September 1994, 175. Chinese own 70 to 75 percent of the nongovernmental assets in Indonesia and over 90 percent in Thailand, Taiwan, and Hong Kong. Ju Yanan, *China: "The Fourth Power"*, in the Retired Officer Association National Security Report," *The Officer*, December 1994, 31.

9. China has increased defense spending by over 200 percent since 1988 and is aggressively seeking new hardware. For more information see Nayan Chanda, "Fear of the Dragon," *Far Eastern Economic Review*, 13 April 1995, 24.

10. Several economic pressures may converge to produce a depression around 2015. For a discussion of some of these see Tom Walker, "Bulls Beware When Boomers Cash In," *Atlanta Constitution*, 24 March 1996.

11. China's annual economic growth rate has averaged 9 percent since 1979. Its growth reached 12.8 percent in 1992, 13.4 percent in 1993, and 11.8 percent in 1994. "Wait and See," *Far Eastern Economic Review*, 31 August 1995, 40. The World Bank forecasts China to become the largest economy in the world by 2002. "Asian Survey," *The Economist*, 30 October 1993, 14. For arguments that China will remain cohesive and the leadership will adapt to handle this growth, see Yasheng Huang, "Why China Will Not Collapse," *Foreign Policy*, Summer 1995, 54-68. For arguments that the communist "dynasty" will collapse see Jack A. Goldstone, "The Coming Chinese Collapse," *Foreign Policy*, Summer 1995, 35-53.

12. Texas already has passed laws that prevent loss of the primary home if the owner declares bankruptcy.

13. This figure is based on a notional US GDP of \$10 trillion, which is based on an average growth rate of approximately 1.3 percent throughout the period and a projected "Greater China" GDP in 2023 of \$67 trillion. The China projection is based, in part, on information in Peter C. Newman, "The Way to the Number 1 Market," *Nation's Business*, October 1995, 56, and "Asia Survey," *The Economist*, 30 October 1993.

14. The study postulates that Khan will likely undergo a process of democratization as its GDP passes the 1995 equivalent of \$3,000 to \$4,000 per capita. This is based on the conclusions contained in Samuel Huntington, *The Third Wave* (Norman, Okla.: University of Oklahoma Press, 1991), 3-207. For a survey of the stability and mature transition of third-generation postcolonial leaders in Asia, see Halloran, 13-17.

15. Khan's inclusion of Indonesia, the largest Islamic nation on earth, has been delicate. However, it has endeared Khan to the Southwest Asian Islamic states.

16. For a survey of the gaps between North and South, see Robin Broad and John Cavanagh, "Don't Neglect the Impoverished South," *Foreign Policy*, Winter 1995-96, 18-35.

17. While Khan is perceived as a benign power, its economy requires vast petroleum and mineral resources. Khan has the power to ensure access to and, when necessary, ownership of these resources. Khan understands the adverse economic consequences of being perceived as a hegemon, and thus is usually a peaceful nation. Nonetheless, Khan will act to preserve access to resources, which will be in its vital national interest. For a description as to how and why such actions are likely, see Hans J. Morgenthau, *The Struggle for Power and Peace* (New York: Knopf Publishers, 1972), 3-35. This view was confirmed by Dr Joseph A. Engelbrecht, Jr., in personal interviews at The Shanghai Institute for Strategic Studies at Fudan University, Shanghai, and at the US consulates in Shanghai and Guangzhou, March 1996.

18. David Greenwood discusses six phases the United Kingdom and the British people went through in the period following World War II to the present regarding reconciliation with their inability to maintain world power status. Dean Acheson was prompted to remark after the Suez debacle of 1956 that Britain had "lost an Empire but not yet found a role." Douglas J. Murray and Paul R. Viotti, eds., *The Defense Policies of Nations: A Comparative Study* (Baltimore: Johns Hopkins University Press, 1994), 280-282.

19. The US has lagged behind other nations in learning foreign languages. For example, even in China, where it was forbidden for many years to conduct official business in anything but Chinese, students were encouraged to learn other languages. Mao Zedong in 1956 urged members of the Chinese Communist Party to "study more about the West and learn foreign languages." Johnathan D. Spence, *The Search for Modern China* (New York: WW Norton & Co., 1990), 568.

20. The Chinese leadership is concerned about the maintenance of internal stability and is aware of the need to invest in improving the infrastructure and lives of those who live away from the economic development occurring near the coast. Cheng Jiagui, at the Beijing Academy of Social Sciences, estimates that China needs to maintain a growth rate of at least 7 percent to maintain social stability. Jiang Zemin has acknowledged this risk. See Craig S. Smith and Marcus W. Bracchli, "Despite Rapid Growth of China's Economy, Many are Suffering," *The Wall Street Journal*, 18 October, 1995.

21. The Carrier Corporation has tripled sales of air conditioners to Asia since 1986 and now believes that by 2000, Asia may account for half its sales. "Asia Survey," *The Economist*, 30 October 1993. This "pell-mell chase after refrigerators" will likely involve use of CFC technology. Because of the increased cost of non-CFC refrigerants, China's temptation will be to use the cheaper and environmentally destructive CFCs. See Cassius Johnson, "From Carbon to Diplomacy: A Sketch of the Interrelations Among Energy, Electric Power, the Economy, the Environment, Global Warming, and Foreign Policy in China, 1995-2025," Air War College regional studies paper, Air University, Maxwell AFB, Ala., 21 February 1996, 5-7. For a short description of the impact these CFCs will have on the ozone layer, see Internet: http://spso.gsfc.nasa.gov/NASA_FACTS/ozone/ozone.html.

22. Vaclav Smil, *China's Environmental Crisis* (Armonk, N.Y.: M. E. Sharpe, 1993).

23. Several researchers have concluded that increases in CO₂ levels would result in an inundation of coastal regions. For further information, see Fred B. Wood, "Monitoring Global Climate Change: The Case of Greenhouse Warming," *The Bulletin of the American Meteorological Society*, January 1990, 42-52; William W. Kellogg, "Response to Skeptics of Global Warming," *The Bulletin of the American Meteorological Society*, April 1991, 499-512; and "Preprints to the Fourth Symposium on Global Change Studies" (over 100 various authors), *American Meteorological Society*, 1993, 21-28, 256-262, 265-267, 290-297, and 335-337.

24. China will be a major contributor to greenhouse gas emissions. China emits 11 percent of all worldwide generated carbon dioxide today. By 2020, China will be the world's leading emitter with over 20 percent of the world's emissions. See Smil, *China's Environmental Crisis*.

25. Of China's 932 million hectares of land, half is semiarid or arid and an additional 270 million hectares are too rocky or mountainous for agriculture. Of the 96 million hectares under cultivation, annual losses amounting to 330,000 hectares are due to poor agricultural practices resulting in the destruction of vital arable land. For further information see *National Report of the People's Republic of China on Environment and Development* (Beijing: China Environmental and Science Press, 1992), 17; K. K. Chadha, "China's Grim Challenge," *Far Eastern Agriculture*, July/August 1993, 32; and Robert T. Slusar, "The Environmental Plight in China," Air War College paper, Air University, Maxwell AFB, Ala., 12 February 1996.

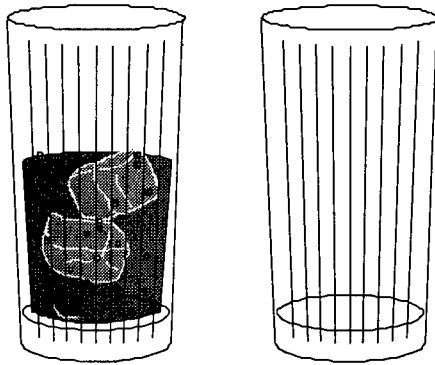
26. The depression in the US and Europe caused a depletion of transportation infrastructure. With their economies still weak, neither is able to mount major humanitarian efforts.

27. Despite the cited agriculture problems, Khan will likely be able to feed itself in most years. For an analysis of how, see Vaclav Smil, "Feeding China," *Current History*, September 1995, 280-284.

28. The combined economy of "Greater China" is forecast to surpass \$67 trillion (1995 dollars) in 2023. Newman, "The Way to the Number 1 Market."

Chapter 7

Halfs and Half-Naughts



The dawn of 2025 finds this world in turbulence. As some nations crest Toffler's "Third Wave"¹ and transition from an industrial to an information-based society, they continue restructuring at all levels. The United States is not the only society feeling the effects of these changes. Those who manage this change prosper; those who do not risk joining the ranks of the have-nots.

The world is divided into haves and have-nots. Many societies have experienced growth and development. Others are swamped by overpopulation pressures, food shortages, poor health conditions, overwhelmed social services, and the resultant widespread unrest.² Conflicts produced by these problems spur nationalism and grievances around the world, splitting nation-states and sometimes threatening the interests of the four superpowers.

Halfs and Half-Naughts is placed in the center of the Alternate Futures strategic planning space (fig. 7-1). Technology has evolved rapidly, but the advances are uneven and often unavailable to those without the training and infrastructure to use them effectively. Revolutionary advances in the

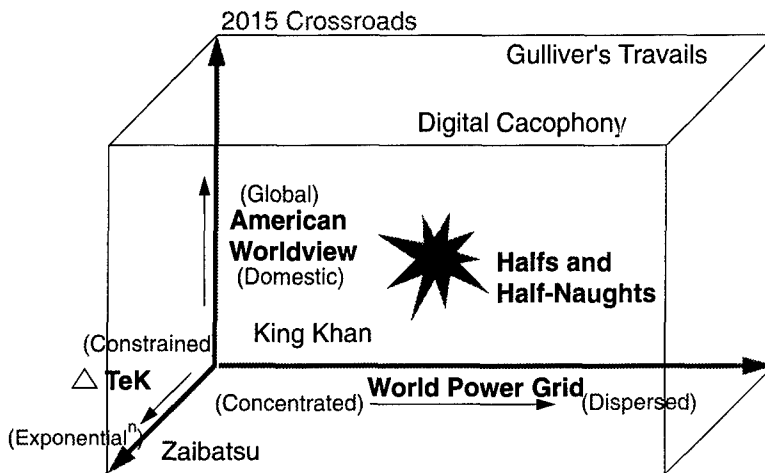


Figure 7-1. Strategic Planning Space for *Halfs and Half-Naughts*

communications and information realm are offset by less impressive developments in areas dealing with the environment, transportation, and energy. As a result, Δ TeK is partially Constrained and partly Exponential^a. The creation of new countries and the growing importance of economic clout relative to military strength characterizes a World Power Grid which is currently Concentrated in the hands of a few actors but evolving towards a Dispersed structure. Recent world events have shifted the American worldview towards a Global perspective following a period of Domestic focus.

Plausible History

Even in the 1990s, observers were commenting on the role of nationalism in splitting existing states (fig. 7-2).³ The Balkans were the epitome of this trend and after a short interlude, Croatian nationalism ripped apart the fragile Dayton peace accords in 1998.⁴ US-led NATO forces formed in a de facto military alliance with Russian troops to form a peace-making coalition, reimposing the status quo by 1999. The painstaking reconciliation process mandated a semipermanent 30,000-member peacekeeping force split between the US, other NATO nations, and Russia.

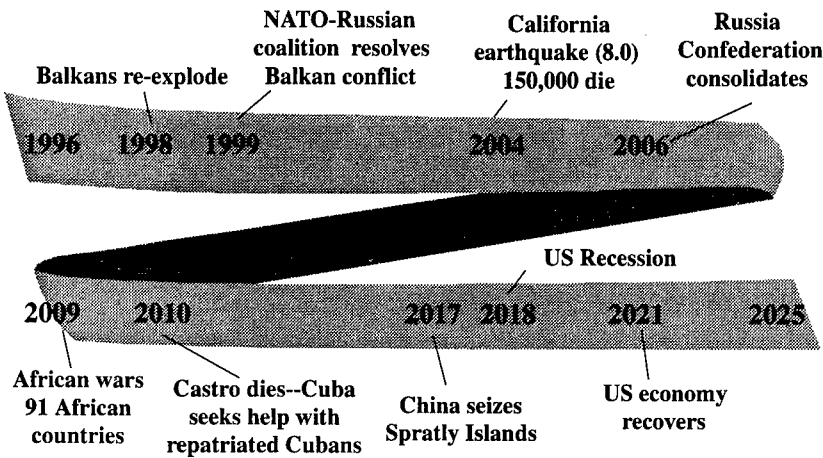


Figure 7-2. Plausible History for *Halfs and Half-Naughts*

In 2004, the American worldview was shocked into a domestic focus. The long-feared California earthquake was devastating, measuring 8.0 on the moment-magnitude scale.⁵ It left 150,000 dead, 200,000 injured, and millions with little food, water, or shelter. The governor of California called on the National Guard to contain widespread looting and assist cleanup efforts, but the situation spiraled out of control. The president had to authorize active duty military assistance, and elements of three divisions were required to control the situation.

While some world actors consolidated power, others split apart. For instance, by 2006 most of the former Soviet republics consolidated into a broad economic “common market” as a counterweight to a European Union (EU) that refused to admit them. The individual nations retained sovereignty,⁶ but the elimination of local customs barriers and agreement on common interests helped accelerate Russia’s economic reconstruction. In contrast, African states continued to fracture.⁷ Continued population growth fueled this fire, and political and social instability hampered food production. Several civil assistance operations were mounted by different state and nonstate actors in an effort to retain access to key resources.

In 2010, Castro's death brought an end to communist rule in Cuba. As a result, the Cuban economy accelerated, which in turn encouraged expatriate Cubans to return home. The new Cuban government asked for US help in dealing with the influx of "immigrants." The US responded to the region's newest democracy by investing billions of dollars in Cuba. Most of the US looked on with uneasiness as repatriated Cubans joined with leaders on the island to propose US territorial status for Cuba, sparking a controversial debate within the US. The southeast supported territorial status, and the rest of the country opposed it. This debate helped keep US attention focused inward.

This domestic focus drove the US to acquiesce to China's 2017 occupation of the Spratly Islands.⁸ Japan and Russia rejected China's claim and demanded action,⁹ but the US was reluctant to do more than lodge a protest. The US response alarmed and angered Japan, whose investors retaliated by dumping large amounts of US bonds into global financial markets. This triggered a recession in the US. Tensions between Russia, Japan, and China caused the world to worry about a major superpower confrontation for the first time since the end of the cold war.

The continuing information revolution righted the US economy by 2021. This recovery coupled with fears of foreign superpower confrontations and the attendant implications for the US to foster a more Global focus to the American worldview.

The Nature of Actors

Nation states still dominate the international arena. The US, China, Russia, and the European Union have spheres of influence. They are the world's preeminent powers, all roughly equal when combined political, economic, information, and military strengths are considered.¹⁰

Several factors are eroding nation-state sovereignty both internally and externally. A fair number of multinational corporations are surpassing all but the strongest nation-states in economic clout. Thirty-seven MNCs have greater annual income than the gross domestic product of two-thirds of the world's states.¹¹ Part of their influence is due to the increasing

importance placed on economic growth fueled by the tremendous increases in information technology. This technology has also rendered state boundaries permeable,¹² despite increasing security concerns and efforts.¹³ Additionally, criminal mafia organizations, such as the Sonoran Drug Cartel, have become very powerful.¹⁴ The Sonoran Drug Cartel maintains its own mercenary army as a special forces unit to guard its assets and terrorize recalcitrant opponents.¹⁵

The Nature of International Politics

International politics are divided between the older-style nation-state relations and evolving discussions with nonstate actors. The four superpowers work through the UN Security Council or conduct bilateral diplomacy to address potential conflicts. Meanwhile, many states are struggling or even collapsing. Where states are weak, a volatile mixture of MNCs, nongovernmental organizations, and foreign interventions results in frequent conflict. This situation makes foreign policy coordination between the US Departments of State, Commerce, Justice, and Defense vital to protecting US interests in these areas.

The Nature of US National Security Strategy

Envy and resentment between the haves and have-nots fuel conflict in this world.¹⁶ In response to these tensions, the US military relies on a "carrot and stick" approach: civil-military and humanitarian operations to help where it can and the use of force when needed.

The strategic challenge in this world is to meet the dramatic increase in the number of "other military operations" while DOD budgets continue to decline. The strategy used is similar to that of the late 1990s, when a strategy of engagement and enlargement drove US foreign affairs, but the presence of several peer competitors adds a new dynamic.¹⁷ Peer competitors will quickly fill the voids left by US inaction, increasing their status and regional influence at the expense of US influence. At the same time, engagement in troubled areas

must be weighed against diminishing our ability to deter major conflicts or the threat of weapons of mass destruction.

The US must also consider its responses to world events in light of the oscillating American worldview. Support for overseas engagement is not guaranteed and may shift rapidly in response to events.

The Nature of Humanity

In *Halfs and Half-Naughts*, social interaction is colored by nationalism, cultural and religious differences, and economic disparity. People generally feel less secure today than they did 30 years ago because of the increasing pressures from many directions.¹⁸ Information technology has made people more aware of their cultural differences and of significantly different standards of living.¹⁹ The rising power of drug cartels has exacerbated the negative social influence of drugs, amplifying crime problems in the US and other societies. The result of all of these events is a society which demands ever more from its government and federal agencies, to include the military, and is less satisfied with the results.

The Nature of Technology

Technology forecasters in the late twentieth century were right about the great advances in computers, but underestimated the speeds reached in 2025. Personal computers process information five million times faster than in the mid-1990s²⁰ and most have quintibyte²¹ storage capacities thanks to the exploitation of molecular-level technologies.²² Encrypted communications are the norm, and data transfer is done at speeds of terabytes²³ per second rather than bits per second.²⁴

These technological advances have been harnessed to a joint planetary defense arrangement between the four major powers. The project is as much an effort to encourage cooperation as to maintain a space shield against asteroids.²⁵ Technological advances have also stimulated the proliferation of WMD. Thankfully, their use has only been threatened: states are unwilling to risk their use, and terrorist groups have so far been unwilling to risk the loss of public or state support which could result from mass slaughter.

On the other hand, revolutionary advances have come primarily in those areas in which the wealthier societies have an interest. Exploitation of these technologies and their accompanying prosperity remain concentrated with the state and nonstate "haves." Areas of concern to poorer groups have seen little new development, providing an additional spur to conflict.

The Nature of the Environment

The environment can be characterized as camouflage (mottled green and brown) because those areas that can afford it have experienced a "green revolution" which others cannot afford. The lack of revolutionary energy technologies has left fossil fuels as the dominant energy source. This makes global warming a major concern. Water has become a major source of conflict in Southwest Asia, the Middle East, and portions of Africa.²⁶

The Nature of the Defense Budget

This world has seen a continued decline in the purchasing power of the defense budget (fig. 7-3). The Spratly Islands problem caused a temporary spike in defense spending, and recently the DOD budget has again turned upward. Over the last 30 years the US GDP has grown at a rather modest 3 percent annually. The defense budget (just over \$250 billion in 1995 dollars) represents

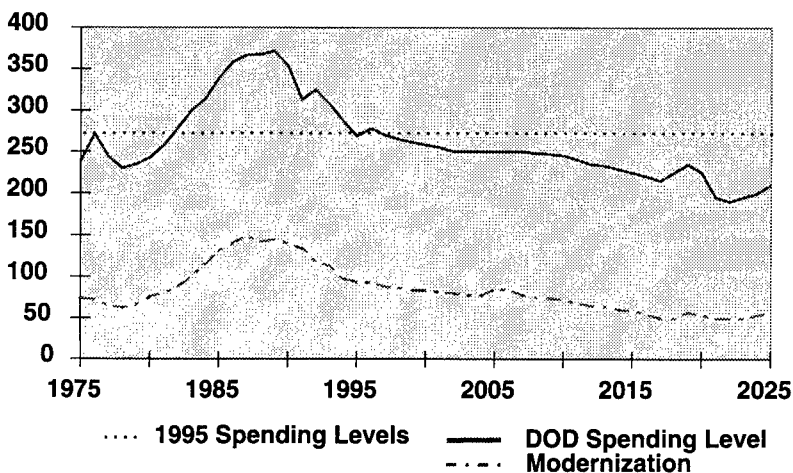


Figure 7-3. DOD Budget (Constant FY95 \$B) for *Halfs and Half-Naughts*

just under 1.5 percent of the GDP, and modernization budgets have stayed below 33 percent of total defense outlays.

Capabilities

Military forces in this world must be constantly ready to engage across the entire spectrum of conflict. The highest priority is deterring the use of weapons of mass destruction. The Defense Department also needs special operations capabilities to conduct other military operations, conventional forces to respond to lesser or major regional contingencies, and the ability to deter or fight in a major conflict with a global superpower. The US must stand ready to operate against unconventional forces in its fight against the drug cartels. Therefore, military forces must be flexible, ready to act, and easy to support.

Though the US leads developments in advanced information systems, the increasing threat requires front-line forces, with accompanying doctrine to conduct information warfare for and against military and civilian systems. The spectrum of conflict stretches into space, where space-based assets have direct offensive capability, as well as providing force multiplication.

Implications

US security forces must be both mentally and physically flexible to meet this remarkably diverse spectrum of conflict. The “old” threat of industrial-age nation-state conflict (conventional or nuclear) still exists, requiring techniques and weapons capable of surviving and succeeding in rapid, intense, and large-scale conflict. However, the addition of new and often destabilizing influences injected by the new global balance of power, the rise of nonnation-state actors, and the growing incidence of attacks via the electronic realm of cyberspace require forces with doctrine and equipment applicable to all of the above threats. Customized training on demand, easily accessed and assimilated, is vital to “shifting gears” rapidly between mission types.

Operational flexibility is a must. Military forces must have the ability to shift rapidly from humanitarian support into

combat against unconventional mercenary forces or against a major national power, then transition into peacekeeping operations. A crucial contributor to success is the ability to pack up and move rapidly as situations evolve.

Summary

Halfs and Half-Naughts is an extremely demanding world for military forces and organizations. Keeping all of the drivers in "the middle of the box" makes them almost scalar quantities rather than vectors. While their magnitude is evident in the sweeping changes in the future, the lack of direction means all potential military missions from the other futures are present simultaneously. The result is the most diverse set of challenges in our six worlds. These challenges result from a world where the American worldview is Domestic but moving towards global concerns as the year 2025 arrives. As to technological progress, Δ TeK has been Exponentialⁿ in some areas, but Constrained in most others. Finally, the World Power Grid is transitioning from Concentrated to Dispersed.

Notes

1. Alvin Toffler and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century* (New York: Little, Brown, and Co., 1993).
2. Robin Broad and John Cavanaugh, "Don't Neglect the Impoverished South," *Foreign Policy*, Winter 1995-96, 18-35.
3. Daniel S. Papp, *Contemporary International Relations: Frameworks for Understanding* (New York: Macmillan College Publishing Company, 1994), 6-7.
4. Although less publicized than Serbian aggression, Croatian nationalists have designs on portions of Bosnia-Herzegovina. Many Bosnian Muslims believe Croatia and Serbia have a secret deal to divide Bosnia-Herzegovina between them. Croatians have an army which successfully defeated the Krajina Serbs, and *Time* magazine summarized the situation succinctly: "In 1993 there was only one big bully in the Balkans, the Serbs. Now there are two." Kevin Fedarko, "The Balkans: New Victors, New Victims," *Time* 146, no. 8 (August 21, 1995): 48-50.
5. Most seismologists have abandoned the familiar Richter scale (based on seismograph readings) for the more precise moment-magnitude scale (based on total energy released by the earthquake). For comparison, the 1906 San Francisco earthquake was estimated as 8.3 on the Richter scale and 7.7 on the moment-magnitude scale. The Northridge earthquake of

1994 was 6.7 on the moment-magnitude scale. There are many different faults in California under stress in 1996. Opinions vary, but the level of stress could produce an 8.0 magnitude earthquake in the Los Angeles area or even a magnitude 9.0 quake in Northern California. An earthquake during the day would cause death tolls to rise dramatically. See "Living With California's Faults," *National Geographic Magazine* 187, no. 4 (April 1995): 2-35.

6. This trend has already begun. Belarus is moving towards a "Soviet-like" union with Russia. See the Associated Press story, "Belarussians Rethinking Move to Independence," *Montgomery Advertiser*, 31 March 1996. This was followed up by another Associated Press story, "Russia, Belarus to Form Union," *Montgomery Advertiser*, 3 April 1996.

7. See Dr Karl P. Magyar, "Culture and Conflict in Africa's History: The Transition to the Modern Era," in *Conflict, Culture, and History: Regional Dimensions* (Maxwell AFB, Ala.: Air University Press, 1993), 229-289. "Africa Unravels" is cited as a major potential wild card by John L. Petersen, *The Road to 2015: Profiles of the Future* (Corte Madera, Calif.: Waite Group Press, 1994), 321-322.

8. Magyar agrees that the US would not intervene if China seized the Spratly Islands in these circumstances. Dr Karl P. Magyar, faculty at Air Command and Staff College, Air University, Maxwell AFB, Ala., interview with one of the authors, 9 April 1996.

9. Japan is already uncertain about the potential US response to a crisis in the South China Sea, which would threaten vital shipping routes bringing oil to Japan from the Middle East. *Strategic Assessment 1995* (Washington, D.C.: National Defense University, 1995), 28. Russian support for Japan is postulated as a power balance with China and an effort by Russia to strengthen ties with Japan.

10. For a discussion of the information dimension of power see Joseph S. Nye, Jr., and William A. Owens, "America's Information Edge," *Foreign Affairs* 75, no. 2 (March-April 1996): 20-36.

11. This is a conservative estimate of trends which drive the emergence of economic power in MNCs. As of 1991, 19 of the world's top 50 economic units (and 44 of the top 100) were MNCs rather than nation states. As states continue to divide and MNCs grow, this trend should continue. Daniel S. Papp, *Contemporary International Relations* (New York: Macmillan College Publishing Co., 1994), 94-113.

12. In his chapter titled "The Eclipse of Geopolitics," Gilder discusses technology's implications for conventional views of national sovereignty. George Gilder, *Microcosm: The Quantum Revolution in Economics and Technology* (New York: Touchstone, 1989), 353-370.

13. "The Global Network is a historically unprecedented highway system that defies nationalism and borders." This statement in Schwartau's introduction to information warfare outlines the basic thesis for the entire book. Schwartau discusses the threat of information warfare and suggests possible

defensive actions to ameliorate US vulnerability. Winn Schwartz, *Information Warfare* (New York: Thunder's Mouth Press, 1994), 20.

14. Narcoterrorism has been proposed as one of the prime threats in the twenty-first century. Schwartz believes this threat will be one of the sources of information warfare-style attacks on the US. Schwartz, 34-35.

15. Toffler and Toffler, 198.

16. Information technology also helps poor people understand how poor and disenfranchised they are. Poor people with nothing to lose and with access to weapons have little reason not to threaten others. Petersen titles this trend "The Poor Know They Are Poor and Get Weapons." Petersen, 330-331.

17. The 1995 national security strategy asserted the United States was the "world's preeminent power" and that "the threat of war among great powers [has] receded dramatically." The 1995 national security strategy is the basis for current US military strategy. *A National Security Strategy of Engagement and Enlargement* (Washington, D.C.: The White House, February 1995), 1.

18. The source of this pressure is the continuing changes in world societies. Paul Kennedy summed it up this way: "As the twenty-first century approaches, therefore, the peoples of the earth seem to be discovering that their lives are ever more affected by forces which are, in the full meaning of the word, irresponsible." The forces he refers to include world population growth, the rise of multinational corporations, global environmental degradation, international migration, and the decline of national sovereignty. See Paul Kennedy, *Preparing for the Twenty-First Century* (New York: Random House, 1993). Added to these trends are the rapid and often turbulent changes in the lives of individuals in relatively prosperous societies transitioning or operating in a "third wave," or information-based society.

19. Envy and resentment are likely sources of conflict as have-nots around the world learn more about how well the haves live. Schwartz, 36.

20. Current rates of growth would lead to processing speeds one million times faster than 1993 standards. See Will Kopp, "Vital Speeches of the Day," vol. 60, no. 8, 244. Speech delivered at Perry/Morgan County National Honor Society Recognition Conference, Zanesville, Ohio, 22 November 1993.

21. One quintibyte equals 10^{15} bytes.

22. Molecular technology has the potential to make commonplace pocket supercomputers that are able to store "every book, magazine, pamphlet, and newspaper ever printed, complete with graphics . . . in a volume the size of a credit card." Petersen, 59-60.

23. One terabyte equals 10^{12} bytes.

24. See appendix B for a discussion of trends in computer capabilities.

25. Most agree that a planetary defense system should be created as a planetary project or responsibility. Building international coordination, cooperation, support, and trust would be vital. See "Planetary Defense System: Catastrophic Health Insurance for Planet Earth," **2025** white paper

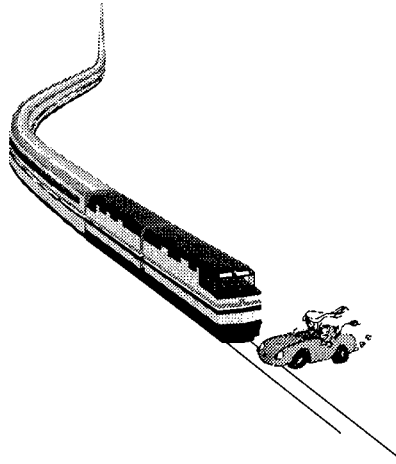
ALTERNATE FUTURES FOR **2025**

(Maxwell AFB, Ala.: Air University, 1996). This history postulates that the major powers use this cooperation for both establishing a space shield and as a method of reducing tensions and building trust between powers.

26. Frank Gallegos and Jan Kinner, "World Water: War or Peace?" *Strategic Structures Course Book Volume I* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 284-299.

Chapter 8

2015 Crossroads



2015 Crossroads is a bridge designed to serve as a decision point from which the other alternate futures might be reached. Created at the request of the chief of staff of the Air Force (CSAF), this world bridges the gap to the more challenging futures of 2025. The chief tasked the Alternate Futures team to develop a future in 2015 that conformed to several criteria. First, it should contain a major conflict since the world has seldom gone more than 20 years without a war.¹ Second, the 2015 force structure would consist of current inventory items (as current political realities suggest), augmented by those planned for in the current program objective memorandum (POM), such as the F-22.² Third, the international power structure in 2015 might have begun to solidify into new political or economic blocs. Finally, the world should exist as a waypoint, requiring a strategic decision that potentially would lead to one of the five 2025 worlds. No decision can dictate the exact nature of the 2025 world that descends from *2015 Crossroads*, but the strategic decision may provide an impetus.

Given the CSAF's criteria, the team began to plot the world's position in the strategic planning space (fig. 8-1). Plotting this

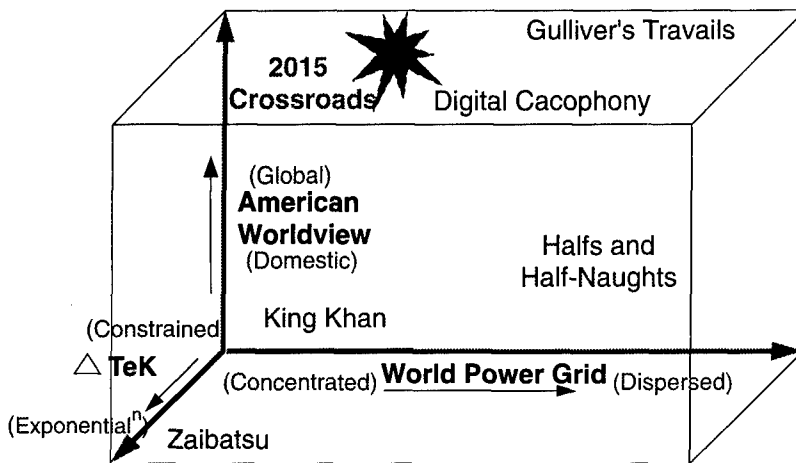


Figure 8-1. Strategic Planning Space for 2015 Crossroads

position required the team to derive the general nature of the three drivers from the CSAF's description of the future environment. First, the Alternate Futures team resolved Δ TeK's nature. If the military forces available in this world were those already planned for, then it was reasonable to assume that Δ TeK was Constrained. The next driver analyzed by the team was the American worldview. Since one of the criteria was that a war should occur around 2015, and involve US forces, it seemed reasonable that the predominant American worldview was Global. However, the requirement to model a strategic decision point left open the interpretation that America might choose to turn inward. It was decided that such a change of focus could occur if war caused internal dislocations in an economy subject to achieving growth with evolutionary technology. Accordingly, it was decided that the American worldview was Global, but with pressures to turn inward. Finally, a World Power Grid similar to that of 1996 is characterized as Concentrated, but trending towards Dispersed.

The success, failure, or direction of national policies in the 10 years following 2015 may lead towards any corner of the strategic planning space. For instance, if the US is able to successfully solve near-term problems without mortgaging the future, while restraining the nascent ambitions of near-peer

competitors, this world could converge to *Pax Americana*. Conversely, an increase in US war casualties might lead towards *Khan* if the American reaction was to shun external involvements. Given only a decade between 2015 and 2025, with Δ TeK Constrained, it is unlikely that *Star Trek*, *Zaibatsu*, *Digital Cacophony*, or *Byte!* are fully achievable from 2015 *Crossroads*. Nonetheless, movement in those directions is possible. The next section presents the plausible history used to get from 1996 to 2015.

Plausible History

By 2001, relations between the European Union and Eastern Europe improved, and EU membership was offered to Ukraine, Poland, and the Czech Republic (fig. 8-2).³ These countries quickly accepted the offer, despite some grumbling on the part of Russia. Meanwhile, Congress passed a balanced budget amendment in 2002, restricting US budgetary options and thereby turning the American focus somewhat inward, lest the cost of overseas adventures demand domestic budget cuts.

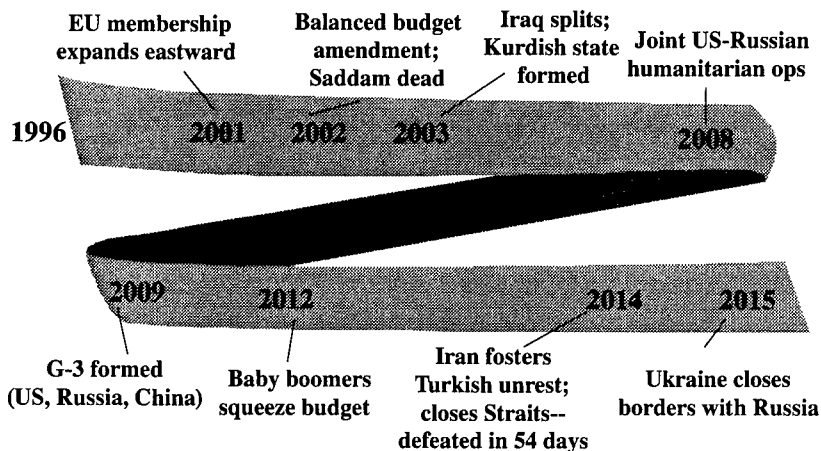


Figure 8-2. Plausible History for 2015 *Crossroads*

In the same year, on the other side of the globe, Saddam Hussein's unlamented death led to the formation of a Kurdish state in former Iraqi territory, an event which encouraged

Turkish and Iranian Kurds to agitate for the formation of "Greater Kurdistan."⁴ These movements became so violent and widespread that in 2006 Turkey and Iran threatened to crush Kurdistan.⁵ This credible threat led most factions to curb their activities, but tensions still simmered. Turkey and Iran continued to exert economic and diplomatic pressure against the Kurdish government, demanding that it police the extremist factions.⁶ This action was difficult because Kurdish forces could not cross borders freely, and the majority of Kurds have remained in their ancestral homes rather than relocating to the fledgling Kurdish state.⁷

Great power relations dominate the political and economic scene. In 2008 Russia and the US conducted combined humanitarian operations in Africa, establishing a precedent for governmental cooperation and combined military operations in areas where interests have not traditionally overlapped.⁸ Meanwhile, China and the US sought better mutual understanding and relations. They increased military-to-military exchanges, and discussed the possibility of combined exercises. By 2009, these two successful partnerships led to the formation of the "Group of 3," or G-3, as a coordinating body for the international security concerns of Russia, China, and the US.

The US focus oscillated as priorities changed over time, first addressing internal difficulties, then shifting to address external issues. In 2012, the retirement of the "baby boomers" began to place further strains on the federal budget, turning the American focus inward.⁹ Certain hostile governments saw an opportunity in this renewed diversion of American attention from world affairs.

The most aggressive moves were initiated by the Iranian government, which chose to foster Kurdish unrest in Turkey in an attempt to topple the secular government.¹⁰ Iran chose to influence the character of Turkey's government for a combination of two reasons, first to eliminate a secular government whose nature was anathema to Islamic fundamentalism¹¹ and second to reduce the level of competition for economic cooperation with other countries in the region.¹²

The Iranian government miscalculated America's willingness to support commitments to a long-standing NATO ally.¹³ This

miscalculation resulted from Iran's assuming that their close economic ties to both Russia and China would lead those states to use their influence in the G-3 to preclude US intervention.¹⁴ Instead, Russia and China acquiesced to American involvement.

Initially the US deployed airpower and special operations assets to southern and eastern Turkey, in bases such as Incirlik. American missions were limited to reconnaissance, civil affairs assistance, foreign internal defense (FID), and psychological operations (PSYOP). This assistance enabled Turkey to rapidly gain the upper hand in the Iranian-backed Kurdish insurrection.

Angered by American intervention, Iran closed the Straits of Hormuz to all military shipping and demanded that all Western maritime assets abandon operations in the Gulf within 30 days. Intelligence sources revealed that Iran had deployed its modernized naval and submarine fleet throughout the Persian Gulf and fortified the straits with land-based Silkworm III missiles.¹⁵ The Iranian threat was deemed very credible.

Maintaining open sea-lanes through the Persian Gulf remained a matter of vital interest to American national security.¹⁶ Therefore, the US deployed additional air assets to Turkey, and naval assets to the Persian Gulf, the Indian Ocean, and the Black Sea, where a carrier battle group was placed. Tensions continued to escalate with numerous border incidents. The lid came off when Iranian forces apparently launched a chemical attack against a Turkish army base.¹⁷

Iran's use of weapons of mass destruction—chemical and possibly biological—led the US coalition to emphasize the responsiveness and deep strike capability of aerospace power rather than relying on vulnerable ground forces. Decisive force was employed to minimize the threat of long-term disruptions to the flow of oil. Though Iranian forces fought to the best of their abilities, their military machine and political will were unable to compete with a massive parallel air attack. The US marriage of precision weapons and stealthy air and space forces kept the Iranian forces off balance, paralyzed by attacks across the breadth and depth of their infrastructure.¹⁸ Hostilities ceased 54 days after the initial attack, with over

30,000 American and Turkish casualties including approximately 13,000 dead. No formal peace agreement was signed, and Tehran continues to call for reparations for war damage to their “peaceful” chemical production facilities and nuclear power plants. Iran did agree to open shipping through the Gulf, and its support of the Kurdish uprising in Turkey ceased.

In 2014, Ukraine began to experience an explosion in immigration from Russia, whose economy remained relatively stagnant while the Ukraine’s boomed.¹⁹ Russia had financed growth by running up a massive international debt with its major trading partners, including Ukraine. Then, on 19 April 2015, with their economy under siege from both these factors, Ukraine responded by sealing its borders and canceling all credit to Russia. If Russia reacts militarily, the US is not necessarily concerned with defending the Ukraine per se, but does seek to restrain Russian expansionism.²⁰ The world awaits the Russian, and G-3, reaction.

The Nature of Actors

This world is dominated by the US, Russia, and China. To a large degree it is a tripolar world, with each member of the G-3 dominating its respective sphere of influence. To minimize friction within the G-3, the members support military-to-military exchanges, conduct joint peacekeeping operations, and communicate frequently to discuss differences.

NATO remains a viable entity, though still troubled by requests for military assistance from Partnership for Peace (PFP) members. The EU and Japan have significant economic strength but exert relatively minor influence due to their focus on internal issues. Although multinational corporations have continued to grow in influence,²¹ the nation-state continues to be the dominant world actor.²²

The Nature of International Politics

The G-3 hold formal semiannual meetings to discuss a variety of issues. These include the maintenance of their agreement to divide the arms export market so that each country shares in the proliferation of weapons, and economic

competition between the three is managed. This agreement is similar to OPEC's oil production arrangements.

Over the past 15 years, the EU has focused primarily on internal divisions in an effort to finish the consolidation of the European alliance and governmental structures. NATO has seen an increase in its membership, adding several members of the Partnership for Peace: Poland, Hungary, and the Czech Republic.²³ This brought an increased diversity of culture and opinion to the organization, which has made reaching consensus on policy more difficult. Further, tremendous resources have been expended in bringing the military forces of the new members up to NATO military standards.²⁴ The resolution of the Russo-Ukrainian dispute will be a particularly challenging NATO issue because both Ukraine and Russia are members of the PFP.

The UN remains active in this world. Some operations conducted under its umbrella, like the Kurdish peacekeeping operations, have been effective. Others have met with less success.

The Nature of US National Security Strategy

In many ways, this is a world of tripolar détente. The strategic challenge for the US is to use technology to maintain a qualitative edge against potential competitors.²⁵ America's national security strategy is twofold: to foster a coherent, nonimperialistic Russia with positive control of its nuclear weapons and to support the slow development of a prosperous, nonmilitaristic China.²⁶ While pursuing those objectives, the US wants to preserve sufficient freedom to ensure America's prosperity by leading or manipulating the other members of the G-3. The US also considers the free flow of oil through the Persian Gulf a vital national interest and will respond with decisive force when those interests are threatened.

The Nature of Humanity

The aging of the baby boomers threatens to stratify economic classes in America along age lines.²⁷ Many senior citizens still work and would prefer to continue working rather than subsist at a lower standard of living based on an

inadequate retirement system.²⁸ Because the huge number of retirees strains social programs to the breaking point, most of the younger generation have demanded more control over their retirement investments.²⁹ As a result, Social Security is now voluntary for newly eligible individuals.

In the rest of the world, a continued disparity in standards of living sparks social unrest among the underprivileged. These strains are part of the Turkish-Kurdish-Iranian dispute and in the 2015 Ukrainian-Russian clash. Economic conflict appears to be the source of unrest in most of the world.³⁰

The Nature of Technology

Technology has been advancing at an evolutionary rate in all areas. No new breakthroughs have been discovered that were not predicted in 1996. Especially troubling is the lack of new advances in energy production. As a result, the world remains dependent on fossil fuels.

Though Constrained Δ TeK has not supported higher rates of economic growth, it has allowed the US to remain a qualitative edge against potential competitors. Programmed developments in military aerospace vehicles provide an unparalleled capacity to operate simultaneously across the entire frontier of an adversary's human, industrial, information, and military capacities. The US maintains a dominant position in the world by leveraging technology to develop and acquire those systems needed to remain a superpower. It uses long-range planning to identify the specific systems needed for development. See appendix A for a discussion of long-range planning in the Air Force.

The Nature of the Environment

Both global warming and depletion of the ozone layer are points of hot debate at G-3 meetings. Continued reliance on fossil fuels has accelerated the global warming problem,³¹ and China has contributed significantly to the greenhouse gas emissions that add to the problem.³² As a result, severe weather threatens many parts of the world, as hurricanes, droughts, and floods become more severe.³³ Additionally, some predict that by 2025 flooding in the low countries, island

states, and along coasts will displace up to 100 million people.³⁴

Global warming is not the only problem. The use of chloroflourocarbons has proliferated in much of the world, particularly in China and other CFC black markets.³⁵ The incidence of skin cancer and other skin diseases has climbed as CFCs weakened the ozone layer.³⁶ China and the developing nations either will not or cannot fund the development of alternative sources of energy and CFC-like products. In fact, the developing nations insist they will continue to use CFCs unless other countries provide them with technical and financial assistance.³⁷

The Nature of the Defense Budget

US defense budgets in this world have been marked by a steady decline to approximately \$240 billion in 1995 dollars because of the pressure from the 2002 Balanced Budget Amendment (fig. 8-3) and growing social spending. The US economy has only grown at 3 percent annually, further constraining the funds available for defense. Today, in 2015, DOD budgets stand at approximately 2 percent of the total US GDP. As a result, the forces available today are primarily those programmed in 1996–2001. No new weapon systems have been fielded in the last seven years.

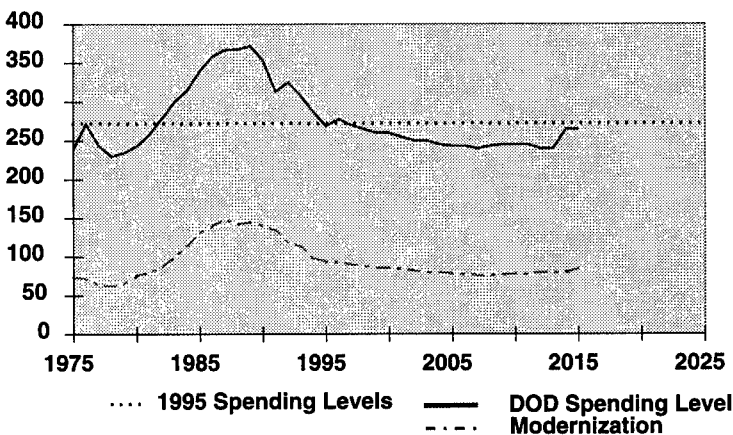


Figure 8-3. DOD Budget (Constant FY95 \$B) for 2015 Crossroads

Capabilities

Depending on the situation, forces must shift rapidly from one theater to another.³⁸ Unique capabilities are often provided by a limited number of platforms, and the units containing those forces may spend up to nine months a year deployed.

Organic and decentralized logistics become a must to support rapid response efforts that shift from theater to theater. Prepositioning of supplies is generally the option of choice. Information on equipment withdrawals or additions to prepositioned stocks is maintained with a bar code system, linked in a redundant network to a central computer.³⁹ This same network provides detailed information to logisticians seeking to support and sustain forces operating at the tactical or operational level.

To limit the footprint of American military forces in theater—thereby reducing the number of personnel exposed to risk⁴⁰—greater reliance is placed on unmanned aerial vehicles (UAV) for reconnaissance, surveillance, signals collection, and limited attack capabilities.⁴¹ Space systems provide a force-multiplier effect by enhancing the precision capabilities of other platforms and providing in-time communications and intelligence updates, often through links to UAVs and other intelligence sources.

Implications

The military can expect very little modernization for the next 10–20 years, particularly after 2010 as retiring baby boomers indirectly pressure the defense budget. As a result, upgrades may have to take 2015 weapons systems to 2025 and beyond.⁴² Because the US maintains worldwide commitments, the emphasis is on sustaining a high operations tempo without sacrificing readiness. To achieve this result, administrative staffs have been downsized to the minimum and many functions have been “out-sourced.”⁴³ An increased reliance on the larger Guard and Reserve forces helps reduce some of the impact of personnel cuts. The military in 2015 must use every technique available to maintain capability at the lowest expense possible.

The Road to 2025

There are many possible outcomes in the decade after 2015 *Crossroads*. Below are some of these possibilities, along with strategies for moving towards a particular 2025 future.

Pax Americana

The path to *Pax Americana* is difficult. During the war with Iran the US sustained thousands of casualties and the loss of some force structure. If the reaction of the American people is outrage and a pledge "to control world events so this never happens again," then this route becomes feasible.

The US is faced by a world of realist politics that make such a transition difficult.⁴⁴ In this world, military and economic power beget influence. To compete with the peer powers, the US must simultaneously replace force structure destroyed in the recent conflict, modernize all the services, and compete economically. If America successfully answers these challenges, then a *Pax Americana*-type future is possible.

King Khan

If the American reaction to casualty rates in the Iranian conflict is dismay and a turning inward, then the road to *King Khan* becomes an expressway. With a 2015 GDP already greater than America's and no US diplomatic influences restraining militarization, China's military could quickly surpass both the size and sophistication of an American military relying on twentieth century technologies.⁴⁵

Gulliver's Travails

The road to *Gulliver* parallels the road to 2015 *Crossroads*. If the American people view the outcome of recent events as business as usual, then the US military will continue to be overburdened and asked to play the role of the world's policeman. The primary difference is that America has peers in 2015 *Crossroads*. Unless China disintegrates and Russia founders, the key strategic issues in 2025 *Crossroads* differ significantly from *Gulliver's Travails*, although both futures have some degree of Dispersed power.

Other Worlds

The other worlds are less likely outcomes following strategic decision(s) in *2015 Crossroads*. Remarkable breakthroughs, perhaps spawned by global cooperation, would be required to spawn an Exponentialⁿ increase in Δ TeK sufficient to nudge 2015 into any of the four highest technology worlds: *Star Trek*, *Zaibatsu*, *Byte!*, or *Digital Cacophony*. The American world-view, which historically has oscillated, could move towards either dimension. Finally, G-3 competition, particularly if boosted by new technologies, could evolve into a Concentrated World Power Grid, or into a Dispersed state of empowerment for many actors.

While none of these scenarios are entirely within the control of the DOD, it is possible that actions taken over the next 30 years may, in tangential and sometimes unknowable ways, shape the possibilities. This is the challenge of *2015 Crossroads*; it is the fundamental challenge of 1996.

Notes

1. Capt James R. FitzSimonds (USN), military assistant to the director, Net Assessment, in the Office of the Secretary of Defense, stated that his office considers the present timeframe to be similar to the 1920s, an inter-war period. They predict a major war within 20 years. Capt James R. FitzSimonds, "The Challenges of the RMA," lecture, Air Command and Staff College, Maxwell AFB, Ala., 11 April 1996.

2. Maj Gen Joseph J. Redden, commander of the Joint Warfighting Center (JWFC), stated that there is not currently enough money in the acquisition line to support the vision of any single service. The funding line has decreased in two steps, from \$120 billion to \$60 billion to \$43 billion. Maj Gen Joseph J. Redden, "RMA: A View from the Inside," lecture, Air Command and Staff College, Maxwell AFB, Ala., 11 April 1996.

3. Poland and the Czech Republic are the countries' current thinking projects as most likely to join the EU in the short term. Those countries "already have association agreements with the EU, but want full membership by 2000 at the latest." The EU prefers to defer admitting new members for now, as it could block European integration for some time. Ukraine is currently not on the list of those who would be offered membership, but has already initiated "partnership" agreements with the EU. "A Touch of Eastern Promise," *The Economist*, 26 March 1994, 58. For further articles consider Bruce Barnard, "EUs Flawed East Europe Policy," *Journal of Commerce and Commercial*, 25 October 1994, 6A; and Peter Blackburn, "Eastern Europe

frets over falling exports to EU," *Journal of Commerce and Commercial*, 23 May 1994, 11A.

4. The Kurds have long agitated for the formation of a separate state by partitioning portions of Iraq, Iran, and Turkey. Daniel S. Papp, *Contemporary International Relations* (New York: Macmillan College Publishing Co., 1994), 43. The Kurds living in northern Iraq, under the protection of the UN, have voted for representatives to the national assembly of an unofficial Kurdistan. James M. Prince, "A Kurdish State in Iraq?" *Current History*, January 1993, 17-22; and John Marks, "Claiming a Piece of Iraq," *US News and World Report*, 9 November 1992, 37.

5. In 1992, Kurdish terrorists attacked Turkish embassies and businesses in 24 European cities. "Kurdish Militants Attack Turkish Sites in Europe," *Facts on File*, 1 July 1993, 491. As a result, Turkey, Syria, and Iran agreed to stand against a Kurdish state. "Kurds Still Alone: Iraq's Neighbors," *The Economist*, 21 November 1992, 51. In *2015 Crossroads*, the unrest following Saddam's death prevailed upon Turkey, Syria, and Iran to agree to the formation of Kurdistan, but they still will not tolerate "excessive ambition."

6. Turkey's rationale for allowing the Kurds to police their own is based, in this alternate future, on the long-term negative impact of a strike against the Kurdish Worker's Party (PKK) in 1994 that killed a few purported insurgents but evolved into a prolonged operation, draining the blood and treasure of Turkey. John Rosent and John Dosey, "Turkey May Have Brought Itself a World of Trouble," *Business Week*, 10 April 1995, 87.

7. In 1995, Kurds constituted 20 percent of the Turkish population of 63.4 million, or about 12.6 million. They constituted between 15 and 20 percent of the Iraqi population of 20.6 million, or between 3 and 4 million. In Iran, Kurds numbered about 6 million, or 9 percent of the overall 64.6 million people. Thus, the total number of Kurds in the three countries numbers about 22 million. Given sustained regional population growth rates, this number would grow to approximately 44 million by 2025. *The World Factbook 1995*, Central Intelligence Agency (Washington, D.C.: Office of Public and Agency Information, 1995), 202, 204, 426.

8. This appears to be a logical extension of the 1994 Russian decision to act in concert with other major powers regarding Bosnia, in particular Russian participation in the Quadripartite Contact Group. Ruth Walker, "US and Russian Soldiers Salute 'Trench Peacefare,'" *The Christian Science Monitor*, 2 February 1996, 1; also *Strategic Assessment 1995*, Institute for National Strategic Studies (Washington, D.C.: US Government Printing Office, 1995), 57.

9. Current projections are that future employees face dire tax increases unless changes are made to the pension, Social Security, and Medicare systems before the baby boomers retire. Barbara Ettore, "Heads You Lose. Tails, You Don't Win," *Management Review*, August 1995, 8. In the decade following *2015 Crossroads*, other problems are revealed. By 2024, baby boomers' pension funds could become net sellers in the stock market,

reducing the savings available for economic growth. This will inevitably impact the federal government's ability to generate revenues required to support defense programs, among other federal programs. "Baby Boomers Threaten Entire Pension System," *USA Today*, April 1995. 1-2.

10. As early as March 1994, a Turkish Islamic party won 19 percent of the vote in local elections, the result of Turks being unhappy with the economy and the way Turkey was treated by Europe and other Western nations. In particular, the snub by the EU in favor of former Warsaw Pact members demeaned Turkish pride as long-term members of NATO. (In this world, that snub is realized, not just projected). Fred Coleman, "Will Turkey Be the Next Iran?" *US News and World Report*, 6 June 1994, 51-52. Iran has already been tied to efforts to foment unrest in Turkey. In 1993, Turkish police arrested 19 members of a Moslem terrorist group with connections to the Iranian government. "Teheran Tied to Turkish Terrorists," *Facts on File*, 11 March 1993, 170.

11. Iran evidently concluded an Islamic Turkey would further its cultural agenda despite ethnic and religious differences. The Iranian majority is Persian and Azerbaijani, and 95 percent are Shi'a Muslims, whereas the Turks are 80 percent Turkish and 20 percent Kurds, and 99.8 percent Sunni Muslims. Even the languages are different. *The World Factbook 1995*, 202 and 426.

12. As early as 1992 Turkey, Saudi Arabia, and Iran were competing for influence in the former Soviet republics of Central Asia, home to over 50 million Muslims. By 2025 that population will have grown to over 90 million, assuming a 2 percent annual growth rate. Tom Post, "The Great Game: Chapter Two," *Newsweek*, 3 February 1992, 28-29.

13. An attack on any NATO member is an attack on all. For details see the NATO Charter.

14. China has a long history of selling arms to Iran, including nuclear weapons materials, precursor chemicals for mustard and nerve gases, and missiles. China has denied US allegations of illegal arms sales. Kimberly Music, "Rising US-Chinese Tensions Trigger Worries About Impact On Oil Projects," *The Oil Daily*, 12 February 1996, 1-2; and Nayan Chanda, "Drifting Apart," *Far Eastern Economic Review*, 26 August 1993, 10-11. Russia has generally sold through intermediaries such as Belarus, or under the *nom de plume* of the Commonwealth of Independent States (CIS). Sales have included tanks, aircraft, and proposals to supply nuclear reactors. Michael S. Lelyveld, "Muted Reaction to Belarus Deal Signals US Shift," *Journal of Commerce and Commercial*, 21 July 1995, 1; Russell Watson, "So Who Needs Allies?" *Newsweek*, 15 May 1995, 36-37; and "UN Reports On A-Arms Threat," *Facts on File*, 5 March 1992, 157-158.

15. Iran renewed its arms buildup in the early 1990s, including buying Silkworms from China. Papp, 458. Iran already has practiced deploying forces to the islands in the Hormuz Strait. In 1995 they deployed about 6,000 troops there, with chemical weapons and anti-ship missiles. Observers also noted submarines and missile boats operating in the area. Lisa Burgess

and Janet Porter, "Iran's Arming of Islands Fails to Upset Markets," *Journal of Commerce and Commercial*, 24 May 1995, 1B.

16. In 1994 the US imported more than 45 percent of American oil needs, a large proportion of that from the Persian Gulf. That dependency will increase over the long term. Accordingly, "the US has a vital interest in unrestricted access to this critical resource." *A National Security Strategy of Engagement and Enlargement* (Washington, D.C.: The White House, 1995), 21.

17. Iran used chemical weapons during the Iran-Iraq War of 1980–88, and in 1995 had the research basis for implementing biological and nuclear weapons programs and was suspected of possibly possessing nuclear weapons. *Strategic Assessment 1995*, 67–68.

18. Forces deployed included the F-22 Joint Strike Fighter (JSF, once known as JAST), B-2, unmanned aerial vehicles, advanced cruise missiles launched from aircraft, and advanced cruise missiles launched from missile frigates and submarines in both the Black Sea and from outside the Persian Gulf, all enhanced by real-time intelligence gathering, to include en route retargeting information, from secure satellite links. The study participants postulated that the US also had the capability to deny the Iranians access to GPS assistance in their targeting. The US forces used were those projected to be in the inventory in the 1996–2001 program objective memorandum, as per the CSAF's directive. Airborne lasers were not included in this force, as the study participants decided that budget decisions would not have allowed all projected forces to be brought into the inventory.

19. It was postulated that Ukraine's economy would recover from the doldrums of the early 1990s as a result of their improving relations with the West, though Ukrainian reliance on Russian oil and gas is a major issue. This reliance provides a lever that Russia has proven willing to use in attempts to bring Ukrainian policies into line with the desires of Russia. The use of this lever has contributed to declining relations between the two states, providing the incentive for Ukraine to seek outside links. Such outside links allow the Ukraine to move away from the Russian orbit, asserting their independence and promulgating separate policies. The implementation of these independent policies—closing the borders with Russia—is what sparks the strategic crisis in *2015 Crossroads*. "Nicer and Nicer: Ukraine," *The Economist*, 8 April 1995, 45–46.

20. Karl Magyar suggested this motivation for any US reaction. He is working on a similar scenario for another group. Dr Karl P. Magyar, faculty of Air Command and Staff College, Air University, Maxwell AFB, Ala., interview, 10 April 1996.

21. In 1992 General Motors (GM) was the world's 23d largest economic entity, and largest of the MNCs. Papp, 95. GM experienced an average revenue growth rate of 5.3 percent between 1984 and 1993. At this rate of growth, GM would be among the top 15 economic units in the world by 2025. See appendix B for more details. Gary Hoover et al., *Hoover's Handbook of American Business* (Austin, Tex.: The Reference Press, 1995).

22. FitzSimonds.

23. These three are considered the most likely to join NATO in the near term. For a discussion of the merits and probabilities of other former Warsaw Pact members joining NATO see "Partners for What?" *The Economist*, 24 September 1994, 49-50.

24. *Ibid.*, 49.

25. Captain FitzSimonds' office asserts that until at least 2015 the American military will be the sole beneficiaries of the system of systems architecture because of the US's current technological lead.

26. In 1995, indications were that China was improving the quality of its existing strategic nuclear force, but not attempting to increase the size of this force. *Strategic Assessment 1995*, 21. That situation is assumed to continue in 2015, particularly since the three great powers are cooperating in general. The Alternate Futures team's judgment is shared by others. John Mueller, "Polly Principles for Unthreatened Wealth-Seekers," *Foreign Policy*, no. 102 (Spring 1996): 26.

27. Current projections are that future employees face dire tax increases unless changes are made to the pension, Social Security, and Medicare systems before the baby boomers retire. Such regressive taxes will ensure that the future employees enjoy a lower standard of living than their parents. Barbara Ettore, "Heads, You Lose. Tails, You Don't Win," *Management Review*, August 1995, 8.

28. Many members of the "boomer" generation will have to work in retirement due to inadequate savings. Linda Marsa, "Boomers Only," *Omni*, October 1995, 18; and Louis S. Richman, "Why Baby Boomers Won't Be Able to Retire," *Fortune*, 4 September 1995, 48.

29. In the decade following 2015 *Crossroads*, other problems are revealed. By 2024, baby boomers' pension funds could become net sellers in the stock market, reducing the savings available for economic growth. This will negatively impact the ability of postboomers to develop independent retirement programs through investments. "Baby Boomers Threaten Entire Pension System," *USA Today*, April 1995, 1-2.

30. Dr Magyar emphasized that conflicts in the future will be over economics as opposed to ideology. Dr Karl P. Magyar, interview.

31. Over the last 100 years the average global temperature has increased by 1.1 degrees Fahrenheit. Benjamin Santer, of the Lawrence Livermore National Laboratory, developed a model that produced evidence human pollution is responsible for global warming, and his model predicts the temperature will rise another 2.3 degrees Fahrenheit by 2050. Carl Zimmer, "Verdict (Almost) In," *Discover*, January 1996, 78.

32. As of 1993, China emitted 11 percent of all worldwide generated carbon dioxide today. By 2020, China will be the world's leading emitter with over 20 percent of the world's emissions. Vaclav Smil, *China's Environmental Crisis* (Armonk, N.Y.: M.E. Sharpe, 1993).

33. Michael D. Lemonick, "Heading for Apocalypse?" *Science*, 2 October 1995, 54-55. Other impacts might include parched soil, changes in weather

patterns with more severe winters and hotter summers, and declining crop yields. John Harte and Daniel Lashof, "Bad Weather? Just Wait," *New York Times*, 10 January 1996.

34. Lemonick, 55; Papp, 556.

35. The Carrier Corporation has tripled sales of air conditioners to Asia since 1986 and now believes that by 2000, Asia may account for half its sales. "Asian Survey," *The Economist*, 30 October 1993, 14. This "pell-mell chase after refrigerators" will likely involve use of CFC technology. Because of the increased cost of non-CFC refrigerants, China's temptation will be to use the cheaper and environmentally destructive CFCs. Cassius Johnson, "From Carbon to Diplomacy: A Sketch of the Interrelations Among Energy, Electric Power, the Economy, the Environment, Global Warming, and Foreign Policy in China, 1995-2025," (Air War College Regional Studies paper, Maxwell AFB, Ala., 21 February 1996), 5-7. Skyrocketing prices for CFCs have created a lucrative market for smuggling, according to Miami-based US Customs agent Keith S. Prager. This smuggling occurs far down the economic food chain. In America one automotive air-conditioning shop owner was recently "charged with smuggling 60,000 pounds of CFCs from Mexico." "The Treaty that Worked, Almost," *Scientific American* 273, no. 3 (September 1995): 16-18.

36. It takes a century for CFCs to settle out of the atmosphere. Papp, 556.

37. As of 1994 China's contention was that other countries must provide them with technical and financial assistance or they would continue to use CFCs. Jessica Poppela, "The CFC Challenge," *The China Business Review*, July-August 1994, 34-38.

38. As a result, the distinction between supported and supporting commander in chief (CINC) has lost some of its meaning. Dramatic increases in nonmilitary operations led to the establishment of a new functional CINC, CINCHOPE (Humanitarian Operations and Peace Enforcement), and two geographic CINCs replaced the more complicated CINC structure of 1996. The geographic CINCs have been reorganized into two, CINCPAC and CINCEAST, while CINCSpace has subsumed STRATCOM responsibilities.

39. The basic goal of using a bar code system is to streamline and accelerate asset tracking activities. Lesley Meall, "Track It," *Accountancy*, October 1995, 64-67. The use of bar coding and hand-held computers allows for quicker ordering and replacement of stock. E. Gray Glass III, "Automation Ups Customer Service," *Gifts and Decorative Accessories*, April 1993. In 1982, the Logistics Applications of Automated Marking and Reading Symbols (LOMMARS) program management office was established at Wright-Patterson AFB, Ohio, "to develop a standard bar coding technology and to coordinate, direct, develop, and implement this technology within the Air Force." Similar programs are in place for all the services. Mike Fusco, "Next Wave in Bar Codes," *Logistics Spectrum* 28, no. 2 (Summer 1994): 2-3.

40. Magyar, interview.

41. UAVs are stealthy and have great loiter time. Some systems achieve 24 hours or more of endurance. They can pull more Gs and cost less than piloted aircraft. The US Army is considering developing UAVs that loiter and knock out enemy forces once they leave cover. Other vehicles might stay at high altitude to detect ballistic missiles during the boost phase and fire missiles to intercept the ballistic missiles while they are slow and vulnerable. Phil Patton, "Robots With the Right Stuff," *Wired*, March 1996, 212, 215.

42. In 20 years some analysts believe baby boomers will begin selling their stocks and mutual funds, converting them to more stable investments to support their retirement. The author of *The Great Boom Ahead*, Harry Dent, Jr., believes that a depression will occur beginning in 2010, based on the aging boomers withdrawing from the market. Even a recession would negatively impact the defense budget as tradeoffs must then be made between "guns and butter." "Bulls Beware When Boomers Cash In," *The Atlanta Journal-Constitution*, 24 March 1996.

43. For two editorials discussing outsourcing see David Morris, "Risky Rush: Privatization Proceeding without Serious Debate," *Montgomery Advertiser*, 11 February 1996. There are advantages to outsourcing, generally price savings generated by letting more efficient firms perform specific tasks. Also see Tom Lowry, "Outsourcing Expected to Increase," *USA Today*, 25 March 1996.

44. Hans J. Morgenthau, *The Struggle for Power and Peace*, 3d ed. (New York: Knopf Publishers, 1972), 3-35.

45. Current growth rates indicate that China will succeed the US as the world's largest economy by 2001. Based on combined data from *The World Factbook* and *Statistical Abstract of the United States*, 1995 (Washington, D.C.: US Government Printing Office, September 1995).

Chapter 9

Conclusions and Recommendations

The **2025** alternate futures provide six distinctive and stressful operating environments for future air and space power. These six worlds form the framework for quantitative and qualitative evaluation of the many systems and concepts identified by the various **2025** writing teams. Systems and concepts which promise a high leverage capability applicable to many or all of the alternate futures are targeted to ensure the US maintains its current air and space power dominance. Successful targeting of the right concepts is the most immediate contribution of **2025**, and that success depends on the richness and comprehensiveness of the alternate futures.

Alternate Futures Applications

The alternate futures described in this monograph also have tremendous utility beyond the **2025** study. During the course of their development, several organizations requested and received briefings on the alternate futures process and a description of the **2025** alternate futures.¹ These organizations are now using the alternate futures process and the alternate futures themselves to aid in their long-range planning efforts. Other organizations could similarly capitalize on the thousands of hours that went into producing these six visions of the future. This work should be harvested for years to come.

Alternate futures provide an excellent framework for conducting systems analyses. Any set of systems, concepts, or technologies being considered by the US for security purposes can be evaluated for utility relative to the six alternate futures presented in this monograph. These six alternate futures fully cover the US security strategic planning space and should prevent rude surprises.

Another application of these futures is to provide context for evaluation of world events. Although each of the futures discussed above is equally plausible, each of them has distinctive milestones or events. Understanding these

indicators allows one to quickly “place” world news in a specific “world” and understand some of the potential implications.² For example, possible secondary and tertiary effects of a breakthrough in a human-nerve/computer-memory interface could be explored in *Digital Cacophony*.

Recommendations

The Air Force should carefully consider the challenges presented in the six alternate futures and use the alternate futures process and products to aid its long-range planning efforts. For instance, the Air Force Long Range Planning board of directors could use the six alternate futures described in this monograph in their long-range planning seminar games.

The Air Force and the other services should continue to use Air University and the **2025** study approach to conduct intense studies of interest to US security. Some of the best minds in the Department of Defense are available at Air University for a year as students or members of the faculty. To not take advantage of that resource is to miss a rare opportunity to do “out-of-the-box” creative thinking. Year-long projects of intense importance are tailor-made for Air University.

This study also provides a well-developed and tested method for conducting year-long studies on major issues facing large organizations. The study built upon, improved, and synthesized long-range planning processes from a variety of sources. This synthesis has created what the authors believe is the most robust and comprehensive futures methodology developed to date within the US government. Several consulting scientists have concurred with this assessment.³ The **2025** alternate futures study should serve as a template on which US government futures analyses are based. Use of this study and its methodology will enable large government organizations to avoid future strategic surprise.

Finally, the Air Force should conduct another long-range planning effort in three to five years. This study broke new ground, but it will take a few years for the dust to settle and to determine if the original vector was correct or if a steering command is needed.

Conclusion

This monograph sought to accomplish two tasks. First was to produce a detailed vision of the future. This vision needed to be suitable for stress-testing the concepts and technologies contained in the white papers authored by other **2025** participants, while being robust enough to prevent strategic surprises. The second task was to create a study methodology that would enable other organizations to accomplish similarly detailed long-range planning.

George Santayana wrote, "He who does not learn from the past is destined to repeat it." The authors have attempted to produce a document which reflects past wisdom and forges a framework for looking towards the future. If they have done their work correctly, then their customers and those who learn from this study will see 2025 as a year of hope and possibilities.

Notes

1. The Alternate Futures team briefed a host of organizations. The following is a partial list of those organizations: vice commanders of Air Force major commands, **2025** advisors, Eighth Quadrennial Review on Military Compensation, National Reconnaissance Office, AF/LR (special assistant to the chief of staff on long-range planning), Symposium for Modeling and Simulation, Air Force Academy faculty involved with "Education in the Information Age" symposium, and various futurists who vetted the work.

2. Peter Schwartz referred to this method by the following analogy: A well-prepared and experienced actor is given the dialog for three plays. He does not know which scene will be played out when he arrives onstage tonight. Instead, he relies on key details in the scenery to determine how to react. See Peter Schwartz, *The Art of the Long View* (New York: Currency Doubleday, 1991), 199-201.

3. Carl Builder referred to the **2025** Alternate Futures study as "the finest research project ever to come out of Air University." Meeting of the **2025** Strategic Air Warfare Study International, Maxwell AFB, Ala., January 1996.

Appendix A

Air Force Long-Range Planning

The past is done. Finished. The future does not exist. It must be created microsecond by microsecond by every living being and thing in the universe.

—Edward Teller

The Air University-hosted study **2025** is only one of several Air Force or joint long-range planning efforts currently under way.¹ Gen Ronald J. Fogleman, Air Force chief of staff, initiated these study efforts to accomplish several objectives. One of his objectives is to improve long-range planning in the Air Force. Another, more concrete, objective is to discover high-leverage concepts and technologies the Air Force should pursue to ensure the US maintains the dominant air and space forces in the future.² Even though the second objective explains some of the rationale for conducting long-range planning, the question remains, why does the Air Force need to improve long-range planning? This appendix seeks to answer that question. Additionally, it explains the linkage and differences between two of the current long-range planning projects: **2025** and efforts of the special assistant to the chief of staff for long-range planning (AF/LR).

Why Plan?

Strategic planning is the process of looking for shapes in the fog. It is the process of transforming a leader's vision. Vision conditions planning, and planning improves a leader's insight into the most appropriate vision for the organization. Planning transforms vision into those activities that enable the organization to fulfill its central strategic purpose effectively, efficiently, and creatively. Strategic planning evaluates alternatives, seizes opportunities, preserves the organization's vitality, and helps the organization act with unity of purpose even while the environment changes. Strategic planning succeeds best in those organizations where it is an integrated process and where the chief executive officer and the chief operating officer are its champions. Strategic planning fails

where there is no corporate vision, where it is not integrated with other forms of planning, where the chief executive officer and the chief operating officer are not its champions, or where the process of envisioning is not systematized or institutionalized.

Strategic planning is long-range planning.³ It focuses on what may be possible. The planning horizon for strategic planning extends far into the future and beyond the organization's investment and capitalization program. Strategic planning conditions an organization's present behavior in light of the future challenges and opportunities. The challenges strategic planning faces include uncertainty regarding the actual future environment, the constraints imposed by existing plans and programs, the conflicting priorities caused by the urgent need to address present problems and deficiencies, and the changes in corporate leadership that can be expected to occur over time. The interaction of existing creative thinking and analytical techniques, a multidisciplinary approach to planning, and continuous improvements in information technology and automated computational capability can reduce some planning uncertainties. Long-range envisioning and awareness of the effect present plans and programs have on future alternatives can mitigate some of the undesirable effects of existing constraints. Making strategic planning systematic and part of the organization can help organizational unity of purpose and continuity of behavior even as corporate leadership changes.

The opportunities that strategic planning provides include increased awareness of the future consequences of present behavior, the ability to see emerging alternatives and seize opportunities, and the ability of the organization to preserve its vitality by increasing its institutional mental agility in coping with environmental changes. Strategic planning does not eliminate the possibility of surprise or dramatic environmental changes; it does, however, diminish the destructive consequences of surprise. Having envisioned a variety of possible future environments, the organization is able to adapt rapidly to the effects of dramatic changes already creatively foreseen and deliberately assessed. Strategic planning expertise also helps foster the mental agility necessary for adapting rapidly to unforeseen changes. In organizations like the Air Force, where rapid technological

change must be assimilated effectively and efficiently, strategic planning helps discover technological opportunities relevant to the organization's central strategic purpose.

Martin Libicki of the National Defense University, presents several reasons for planning. He observes that "a fundamental tenet of decision-making is to postpone all decisions until the cost of delay in reducing options exceeds the benefit of greater information." In other words, "there are certain long-term processes that are affected by current events" and so decisions affecting those processes cannot be delayed. These include processes with very long lead times, path-dependent processes, and processes with long tails.⁴ An example of a long-lead-time process is a research and development effort. A path-dependent process might be the selection of a programming language for a computer project which becomes the standard for several follow-on activities. A process with a long tail would be retaining expensive capital equipment and the supporting infrastructure, such as a ship-building project not really needed for its own sake but needed to retain ship-building capability. Planners should identify which of these processes is involved in the strategic planning effort because that insight determines which questions need answers and thus what level of forecasting should be accomplished.⁵

The most important function of long-range planning is forecasting to produce informed technology decisions about long-lead R&D efforts (e.g., should an advanced fighter be pursued?). Less important is forecasting to inform program acquisition decisions (e.g., which of two advanced fighter variants to develop?) because the focus there is more medium-term. Finally, the least important application of long-range planning is forecasting to determine capital retention decisions (e.g., how many fighter wings to retain?) because the focus is more near-term.⁶

How Is 2025 Different from Today?

People often remark how things today do not really seem too different from 30 years ago.⁷ People in 2025 will likely repeat the same thing about 1996 being similar in many ways to 2025. This phenomenon occurs because people tend to use

common points of reference to compare the present to the past. In other words, many things 30 years from now *will* be much like they are today. But just as 1996 is very different in many ways from 1966, so 2025 will be very different from today. For instance, in 1966 man had not landed on the moon, computers weighing tons still took engineers to operate, a bipolar world existed, and there was a draft for US military service.

The future will be a product of what exists today, modified by trends extended, trends retarded, countertrends, and surprises. "Poor futurists think of the future as the present; mediocre ones take existing trends and extend them." Few take trends retarded, countertrends, and surprises into account, but they should.⁸ The Alternate Futures team took all five of these influences into account in creating the alternate futures for **2025**. By spending months exploring with futurists, science-fiction writers, technologists, and senior leaders, the Alternate Futures team developed an appreciation for all of the influences that could affect the future. An important step in the alternate futures development was the incorporation of "wild cards" to consider the potential consequences of possible surprises.⁹ Later, this appendix discusses specific wild cards and their potential impact on the future. Appendix B discusses some of the trends considered by the Alternate Futures team.

Different Models, Different Features

A number of different models are possible for long-range strategic planning, each one incorporating different features. No attempt is made here to provide fully developed models. Rather, the discussion of different models focuses on the key features that could be incorporated. Models for strategic planning are either centralized or distributed, with possible variations. Each model must meet the norms required for effective long-range strategic planning. The model should identify the principal decision maker(s) and describe how the decision maker is served, show the interfaces and correspondence between and among planners at each level, and describe and fix responsibility for the products of each of

the four kinds of planning described earlier. There are at least four basic models to consider, with one model being the current planning apparatus used by Air Force headquarters and its subordinate organizations.

The planning structure now in use is a centralized model with duplicative planning entities at each hierarchical layer. Although the planning done in organizational layers beneath the superior headquarters results in the presence of some of the features normally associated with distributive planning, it is a centralized model because critical force structure resource allocation decisions are made by the Air Force Headquarters. This model might be described as centralized with the Air Staff dominant. However, the process of hierarchical duplication is not complete because some of the planning entities in subordinate organizations do not correspond to planning entities in the headquarters. The Air Staff, for example, has a deputy chief of staff for plans and operations (AF/XO). Some subordinate organizations may have separate entities for planning *and* for operations, others may have operations but *not* plans. The initial addition of revolutionary planning as a responsibility of the AF/XO attempted to incorporate maverick and opportunity planning, but neither category of planning has yet been institutionalized or systematized in the sense that is recurring or formalized. Moreover, at this point it is not clear whether or not there will be a designated champion to exploit the ideas produced by the Air Force's long-range planning processes. The newly created office of the special assistant to the chief of staff remains Air Staff dominant, but may propose other organizational forms in the future.

A second alternative is a centralized structure at the Air Staff for policy with distributed and decentralized planning done by the major air commands. This model might be characterized as MAJCOM-dominant.¹⁰ In this alternative, the responsibilities for planning, to include requirements planning, are separated from those of operations. The Air Staff structure corresponds to the Joint Staff structure, with Joint Staff responsibilities reflected in the distribution of duties within the Air Staff.

According to historian Herman Wolk the "air staff" became the "Air Staff" in 1941; the original structure was built along

the Army staff lines with A-1, A-2, an Air War Plans Division, and so forth, reporting to the chief of the Air Staff.¹¹ The chief of the Air Staff was subordinate to the chief of staff of the Army Air Forces. Subordinate to the chief of the Air Staff was the commanding general of the Air Force Combatant Command, whose staff included G-1, G-2, G-3, and G-4 "sections" along with "other staff offices." When the Army Air Forces were reorganized in 1942, the Air Forces were commanded by a commanding general, Army Air Forces, with a subordinate "Chief, Air Staff." The Air Staff included A-1, A-2, A-3, A-4, "Plans," and the "Air Inspector." The "A-Staff" designations were dropped in a 1943 reorganization. Thus, one approach would be to create an Air Staff structure that mirrored the Joint Staff with the MAJCOM staff structure corresponding completely with the Air Staff structure. Such an approach appears in figure A-1.

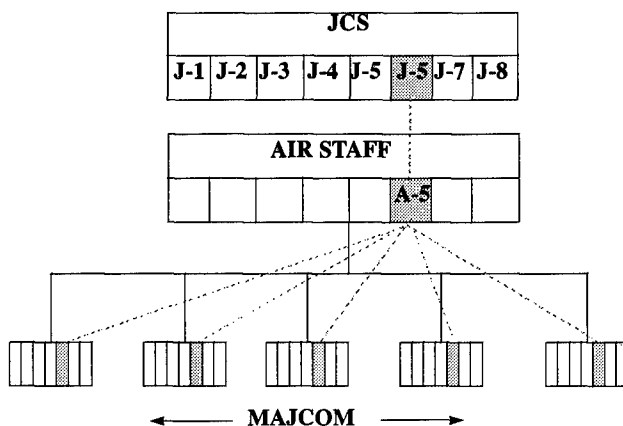


Figure A-1. Centralized, High-Correspondence Alternative

Besides the advantage of high correspondence among and between all the echelons of planners, this model has the advantage of high empowerment for the product divisions. However, unless this model promises to harvest the fruits of maverick and opportunity planning, the combat effectiveness of Air Force systems will not necessarily be high. Consequently, there appears to be a role both for Air University (AU) and for some form of revolutionary planning in this model.

AU could assist by educating and training long-range strategic planners in all of its colleges, but primarily through the School for Advanced Airpower Studies (SAAS). SAAS could be reorganized into an upper division for postgraduates of Air War College and a lower division for postgraduates of Air Command and Staff College. The upper division would also house the intellectual and technology node for Air Force maverick planning. The upper division's annual product would be "special studies," a combined report elaborating ideas generated by the faculty and students of the upper division and the Air Force Institute of Technology (AFIT). Planners at the Air Staff and the major air commands would be "virtually present" in the SAAS upper division via Internet and videoteleconferencing.

CADRE's Wargaming Institute could be connected to the Air Force Studies and Analyses Agency and the war-gaming apparatuses of the other services. CADRE could run seminar war games for concepts of operations and analytical war games for force structure and program objective memorandum (POM) decision making. It is important to note here that the vision, central strategic purpose, and mission of AU is professional military education. Creating a special institute, or the recurring assignment of special studies, risks imperiling AU's primary mission *unless* the necessary resources and change in mission accompany the assignment of significant additional tasks. Even so, AU can contribute. Important caveats to this assertion follow later in this paper.

Decentralized models are also possible and may even be advantageous if one believes that the dramatic increases forecast in information technology will be realized in the next several years. Just as the global missions of the Air Force envision "virtual presence," information technology and "groupware" may allow a "virtual" and highly decentralized planning structure. The potential of such a structure has been demonstrated during the **2025** study.

The "blender" in figure A-2 is the nexus where all four kinds of planning are coordinated and evaluated and the candidate corporate plan is built. Under the present architecture this might be the Plans Directorate, assisted by the long-range planning office or even some new entity that serves the front

end of the Joint Requirements Oversight Council (JROC). Although the CORONA meeting of four stars could be used for this kind of work, this may be less effective than some more structured system. A limitation of the recent revolutionary planning model, for example, may be its reliance on the CORONA meeting to decide which revolutionary ideas will be incorporated into the mission area planning system. A template for decentralized models appears in figure A-2.

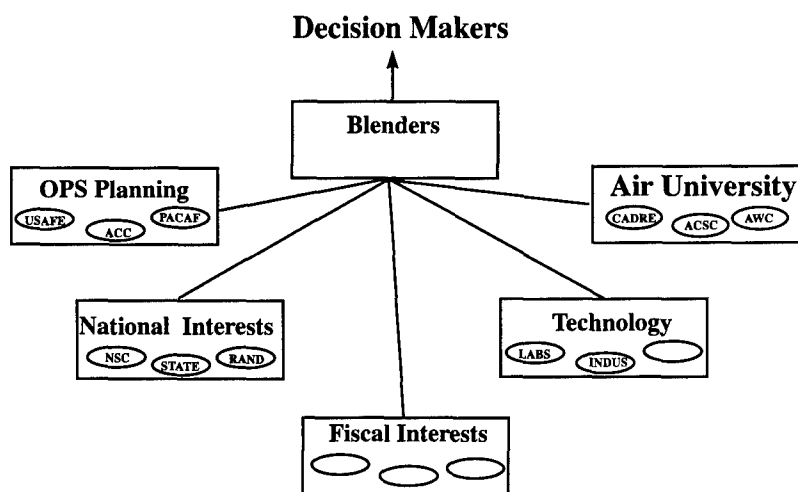


Figure A-2. Generic Decentralized Model

In the decentralized model depicted in figure A-2, there is a high level of correspondence between Joint, Air Staff, and MAJCOM planning entities (as depicted earlier in fig. A-1), with AU serving as a contributing node. Note that this need not be an architecture involving only “military” strategic planners. As national security issues become more complex and increasingly correspond to international security issues, there may be a convergence of national capabilities to correspond to national interests. Thus, other nodes need to be envisioned outside of the armed forces. To structurally and formally include these other nodes today would be a dramatic reframing of the strategic planning problem. To include them through AU, however, would be well within Air University’s charter.

Figure A-3, although titled as the “AU Hub Model,” actually represents two variants of the same, highly distributed model. One variant is a highly decentralized and distributed network, with the Air Staff serving as the “master node” and other nodes in the network serving as responders. In this architecture there would be no long-range strategic planning “offices” required below the Air Staff level, except for maverick planners at AU and opportunity planners at the Air Force Materiel Command and its laboratories. The MAJCOMs would participate through selected individuals attached to the planning apparatus. Recall that the discussion aims at long-range strategic planning, not day-to-day or current mission area planning. Even in the decentralized architecture, it is possible that day-to-day or current mission area planning will still need to be done at the MAJCOM level.

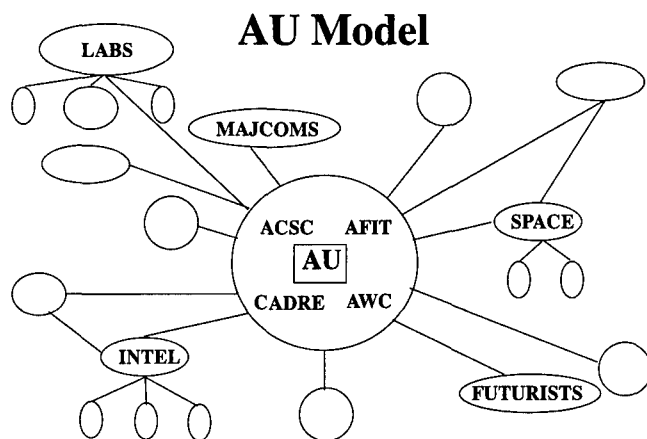


Figure A-3. AU Hub Model

A fourth alternative, a variant of the third, is to change the location and identity of the master node for strategic planning. Given the resources and mission change, AU could house the strategic planners for the Air Force, cross and interconnect them to other planning entities, and assume responsibility for maverick planning, opportunity planning, and analytical and evaluative planning in the form of war gaming. The third and fourth alternatives are highly decentralized, but may require

periodic meetings and physical presence for product production. Although AU has the capacity to make significant contributions to maverick planning, opportunity planning, and analytical planning, these responsibilities would so change the mission of AU that professional military education might suffer.

There are, of course, more variants than these. Hybrids can be created combining whatever are believed to be desirable features in any number of alternative models. The criteria for alternatives or combinations will help guide the selection of the most appropriate model.

Criteria for Selection of a Model and Its Features

There are eight important criteria that any long-range strategic planning model needs to satisfy. These criteria are framed as questions to be asked of any model and its advocates. Before applying the criteria it is first necessary to determine whether each of the four types of planning described earlier add value to the Air Force. Then it is necessary to determine whether any of the four are neglected in the present architectures or in different architectures. Historically, "opportunity" planning is neglected when scientists and technologists are combined with logistics planners.

One might expect that placing research and development under materiel could have some shortcomings, and it did. During the war years, Air Materiel Command, or its predecessors under different titles, had been much more concerned with production, logistics, and maintenance than with research and development. In the postwar period the Air Force continued to subordinate research and development to maintenance and support of those things produced.¹²

This "fox-in-the-hen-house" problem is compounded if no Air Force or Joint Staff entity is charged to provide the "operational pull" of new concepts of operation, employment, and organization. These are the innovative discoveries that the OSD Office of Net Assessment hopes to make for the services.¹³ Thus, the criteria for selecting "how" might be as narrow as "what seems to work" or as broad as a Joint Staff-Air Staff-MAJCOM staff reorganization. The eight criteria for selecting an approach are summarized in figure A-4.

Eight Important Criteria for Long-Range Planning Models

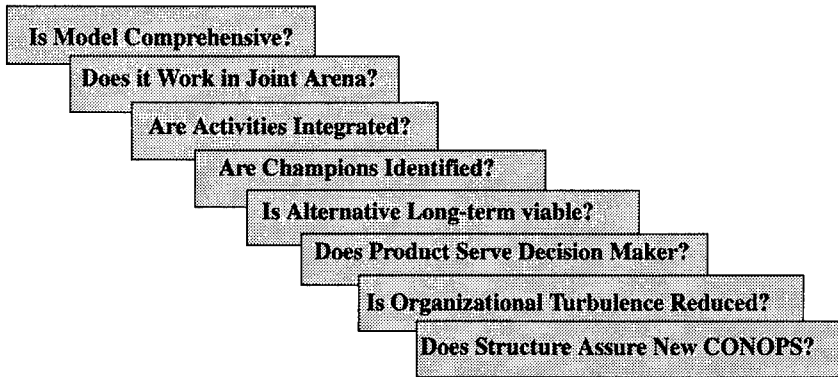


Figure A-4. Criteria for Selecting a Model and Its Features

- **Is the model comprehensive?** Said another way, does it encompass all the strategic long-range planning responsibilities of the organization and all four kinds of strategic long-range planning that must be accomplished? Does it include planners and operators at all subordinate operating levels? Does it make the best use of the Air University including the Air Force Institute of Technology? What is the role of the Scientific Advisory Board? How does the model serve the Joint Requirements Oversight Council?

- **Will the model work in the joint arena?** This is an important criterion, especially if analyses of the tectonic shifts occurring in strategic planning are correct. The services organize, train, and equip forces for employment by the unified combatant commanders. The JROC and the Joint Staff increasingly are involved in the creation of binding policy for the services. Service chiefs need to ensure that their vision and planning harmonizes with that of the chairman and the Joint Staff. Since the Department of Defense fights with combined arms, concepts of operations must be joint and combined. Any long-range strategic planning model that does not generate and serve joint and combined concepts of operations is less likely to add value.

• **Are activities integrated harmoniously, and are they timed or synchronized to occur in such a way as to be mutually supporting?** Planning cycles should serve customer and decision maker needs. The model selected should have each of the four types of planning occurring in a way that supports the overall objective.

• **Are responsibilities clearly identified, and are champions designated for each step of the way from envisioning to implementation?** Unless the model results in a plan of action, the effort expended to generate ideas, search for opportunities, and analyze may be wasted. Thus, champions must be identified for each planning activity.

• **Is there high expectation that the alternative selected will have enduring value even as the responsibilities of the organization evolve,** or is it merely trendy and immediately attractive as a near-term or temporary solution to a perceived problem?

This criterion deserves some elaboration. Cyert and March point out in *A Behavioral Theory of the Firm*, that organizations look for solutions to problems in ways that are themselves problematic.¹⁴ They call this phenomenon "problemistic search." That is, the search for solutions is most often motivated by awareness of some problem presently vexing the firm. The search for solutions commences immediately and with a sense of urgency. Thus, the search is sometimes biased or simpleminded, and the organization often selects the first solution that appears to be "adequate." While the first adequate solution may offer a solution in the near term, it may prove to be inferior to those undiscovered solutions that could have been found by more complex and less biased searches. If the search for solutions to Air Force problems is contracted out for example, additional biases may be introduced unintentionally. This certainly may be the case if a contractor from a firm specializing in strategic planning has been employed to propose a solution to its client's strategic planning problem without sufficient long-term interaction. The right answers to a complex problem rarely emerge from a single meeting or a single advisor, and intuition often proves inferior to analysis.

If an organization uses the problemistic search mode routinely, an array of temporary solutions and workarounds may eventually result in a cascading failure brought about by sudden changes in the environment. Critics have argued that the Mission Area Planning System and the revolutionary planning process that followed it, like the reorganization of the Air Force and the "old new uniform," arose as apparently adequate solutions to problems. It would be most unfortunate to use the simpleminded problemistic search to fix Air Force long-range strategic planning.

These are especially important considerations if shifts in the strategic planning landscape seem to be occurring. If change is afoot, the persistence of the model selected may be the most important criterion. Prototyping may be helpful even after the most rigorous analysis suggests that one approach ought to be superior to another. In the case of the Air Force, there is now some evidence that the Joint Staff desires to increase its "political power" (as defined previously in the section on the dimensions of the strategic planning space for strategic planning) by marginally disempowering the services. Indicators are that the growing authority of the JROC, a change endorsed by the Office of the Secretary of Defense, will change acquisition authority and alter the "power" of the individual services. The "Joint Vision 2010" project within the Joint Staff also aims at enhancing the authority of the Joint Staff through its policy-making power. Whether these observations correctly anticipate a diminution of service power and decision-making autonomy remains to be seen. Nonetheless, planners should consider this possibility when selecting an approach.

- **Do the structure, processes, and products serve the needs of the principal resource allocation decision maker?**

If process, products, and structure are made obsolete because the principal resource allocation decision maker has changed, restructuring the process, or products, or structure (or all three) may be required.

- **Is organizational turbulence minimized?** If a change is contemplated, and unless only a radical change can solve the problems perceived, then the model that promises less turbulence

should be selected. Turbulence can be reduced by “fly-before-buy” prototyping or incremental transition to a new model.

• **Does a new process, set of products, or structure assure new joint concepts of operations and employment?**

Unless the model has features that create new joint concepts of operations to provide the operational pull, there is no assurance that technological push will improve long-range strategic planning within the Air Force. Likewise, if long-range strategic planning improves *only within the Air Force*, the JROC process may cause some Air Force requirements to change or Air Force acquisition plans to be modified.

In sum, it is important to select the right solution to the real problem. Fortunately, creative thinking can generate a wide range of possibilities. Planning norms and criteria, buttressed by rigorous analysis, can evaluate these ideas and help point toward solutions. Every model has advantages and disadvantages, opportunities and dangers, dependent on the characteristics of the model and its features. These characteristics and features are summarized in figure A-5. Once the solution, including a hybrid of several solutions, is selected, it too must have its implementation champions.

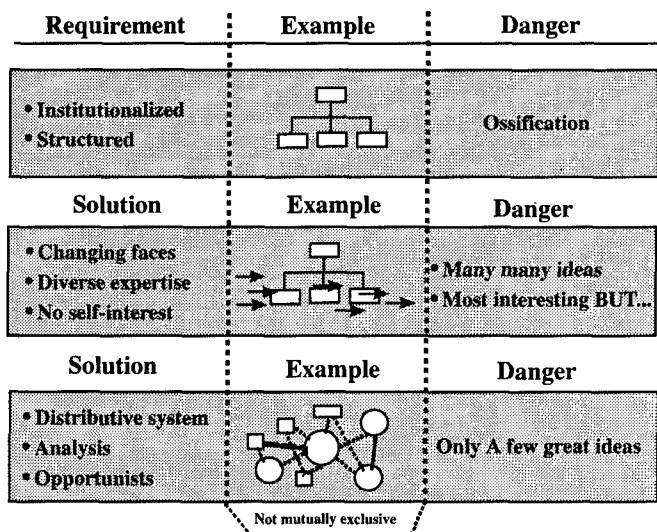


Figure A-5. Characteristics

Implementation Issues

A study of successful innovation completed by Chip Pickett of the Northrop Analysis Center identified 11 characteristics of successful change. Applying 10 of these to the problem of a dysfunctional or not adequately functional planning system within the Air Force yields some useful observations. (The 11th characteristic, "Resources match progress in innovation," does not pertain.)

- **There is a clear threat.** The threats to the Air Force may be the risk of disempowerment, the danger of stultifying innovation and creative thinking, the costs of lost opportunities, the lack of vision, or structures and processes that fail to help meet the central strategic purpose of the Air Force. Additionally, if senior leaders believe "planning is broken," that constitutes a threat.

- **The top level of the organization leads and supports the change.** Because it was the chief of staff of the Air Force who initiated the dialogue on envisioning solutions to the problems extant in Air Force planning and implementation, there is high confidence the top level of the organization leads and supports the process of change.

- **Vision drives the process.** A new vision statement is in the process of development. Thus, there can be high confidence that vision *will* drive the process.

- **The impact that changing the long-range strategic planning structure and process will have on the operations of the Air Force is understood.** This may or may not be the case. The process of envisioning the alternative futures affecting Air Force long-range strategic planning do not appear to have been assessed or understood except intuitively. There is some evidence that impacts are being examined since the formation of the long-range planning board of directors has involved senior leaders across the service. The risk of this group becoming another corporate layer must also be weighed. The need for change may not be understood and the particular solution to the problem, not having been selected, has not yet been articulated and advocated.

- **The structure (form) changes to correspond to any changes made in function or process.** This characteristic

cannot be evident until an alternative is selected. This characteristic should be evident, however, if the approach selected supports the norms and meets the criteria advanced earlier.

- **Change advocates are created and protected.** If the chief of staff of the Air Force is the champion of change, experience shows that the advocates of what others may view as even undesirable changes will be created and protected. If a desirable change is advocated, we can expect the same attributes to be present. If, however, the Air Staff and the MAJCOM staffs are reorganized to improve interfaces and increase correspondence with the Joint Staff, we should anticipate some resistance. Where there is resistance, there also must be protection.

- **Both junior and senior organization members are involved in the development and the implementation of the change.** Many of the alternative models discussed earlier, especially the highly decentralized ones, involve a large and diverse number of organization members. This characteristic will be present in all but the "no change" or highly centralized models.

- **Innovation is tested early and frequently.** To avoid the problems attendant with a simpleminded problemistic search, the search for solutions should not be rushed unnecessarily. Any changes to Air Force long-range strategic planning, for example, can safely be delayed until a new vision statement is crafted. After that, the process and structure selected must be tested against the criteria from its implementation onward.

- **Internal and external resistance is offset.** If the Air Force adopts a strategic long-range planning process that frustrates the JROC process, the Air Staff deputies, or the MAJCOM commanders, internal and external resistance will combine. The goal should be an alternative assessed as "win-win," with the support of the Joint Staff, the Air Staff, and the MAJCOM commanders. It is possible, for example, to reorganize the Air Staff and MAJCOMs to align these staffs better with the Joint Staff and the CINC staffs, as long as the Air Staff and MAJCOM commanders see this change as taking workloads or requirements out of their processes and adding value to the corporate Air Force.

- **Technology progresses at a rate sufficient to support the change.** Some alternative long-range strategic planning models, especially the highly decentralized distributive models, place great reliance on information technology. This technology would need to be in place before the most decentralized and distributive model could be safely selected. The **2025** study afforded the opportunity for testing some elements of a distributive model. In the case of **2025**, technology acquisition anticipated and led the beginning of the study but was delayed and not yet fully developed. Information technology proved highly useful for generating and collecting ideas. Technology which was available subsequently was insufficient to maximize a decentralized approach to developing and analyzing the concepts. It may be that sufficient technology will soon exist within the Air Force to allow some modest form of decentralized or “virtually” centralized planning alternative.¹⁵

What Are the Benefits of Planning?

It is difficult to recall a time when the level of uncertainty about the future and the debate regarding the *raison d'être* of America's armed forces was greater. In this era of constrained defense budgets and changing world structure, it is vital that defense leaders at all levels conduct planning. But until the world's evolution becomes clearer, it is difficult to conduct detailed planning. Instead, it is possible—and imperative—to start thinking about long-term and path-dependent processes which depend on long-range planning.¹⁶

In addition to institutionalizing strategic planning, the Air Force must conduct planning that is robust. The remainder of this appendix discusses the linkages and differences between the Air University-hosted **2025** study and the efforts of the Long-Range Planning Office on the Air Staff.¹⁷ This appendix shows how the alternate futures produced by the **2025** study and the “future operating environments” proposed by AF/LR are complementary, but also how the alternate futures are more robust than the future operating environments.

Requirements for Robust Planning

There are three requirements for robust strategic planning. The first is that the products created should adequately stress the systems of interest. Second, the vision of the future should be broad enough to ensure that the entire range of challenges is adequately captured. The third requirement is that the products should contain sufficient detail and richness to be useful for planning. The remainder of this appendix compares future operating environments from AF/LR to the alternate futures generated by **2025** across each of these requirements.

Stressing the System

Tom Clancy said the “one difference between fiction and history is that fiction needs to be plausible.” David Hume said there is “no necessary connection between logic and fact.” These two statements sum up the danger and limitations of most strategic planning. Because of the difficulty of thinking “outside the box” and making projections from today about the future, most long-range planning results in a fairly constrained strategic planning space as illustrated in figure A-6. This constrained planning space can lead to “rude surprises.”

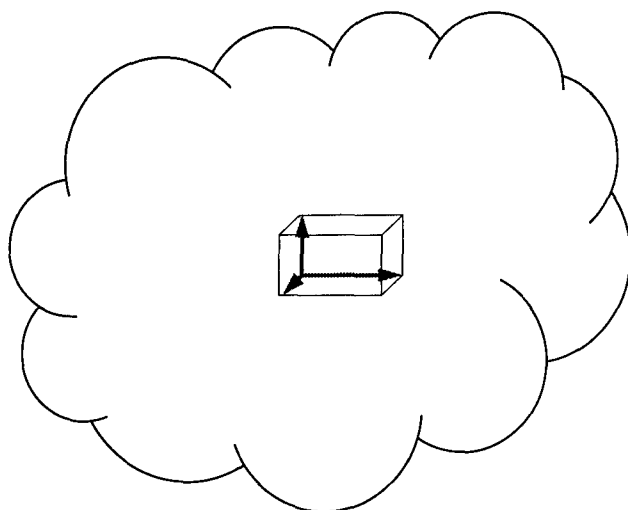


Figure A-6. Current Long-Range Planning Results

In contrast, avoiding surprises is a key metric in the strategic planning space produced by the **2025** Alternate Futures process (fig. A-7). By beginning in 2025 and then “backcasting” to today, we achieved discontinuous jumps in logic that would not be possible using simple trend projections from 1996. Additionally, the interaction of three drivers creates alternate futures that cannot be easily projected using standard strategic planning techniques. It is important to achieve discontinuous jumps because history is full of these jumps. For instance, Germany’s rise in the 1930s to nearly dominate the world in the 1940s was a discontinuous jump. So was the US putting a man on the moon in less than 10 years. The collapse of the Soviet Union is the most recent example.

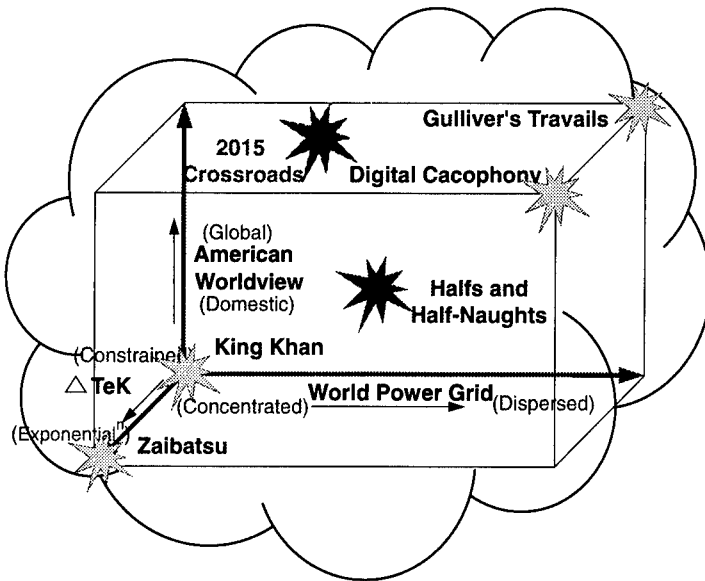


Figure A-7. Alternate Futures Strategic Planning Space

The alternate futures developed for **2025** have as an enduring strength the incorporation of wild cards to capture discontinuous jumps in history. In the alternate future of *Zaibatsu*, the rise of strong multinational corporations creating a relatively benign but unstable world is so different from

today it is unlikely traditional long-range planning would have projected it. Yet such a world is logically created from the **2025** Alternate Futures process by incorporating wild cards and considering the current trend of the growing strength of MNCs. Two technology-based wild cards, development of a computer-human nerve interface microprocessor and safe nuclear fusion, drive this world into accelerated economic development. The combination of these wild cards and the current trends regarding MNCs results in a world of reduced threats to US interests and a new world power structure. This world presents the US with strategic decisions which normally would not be considered under traditional long-range planning, yet presents some challenging alternatives that need to be considered in evaluating alternate air and space forces.

For instance, in *Zaibatsu* the military has to preserve core competencies and "outsource" the rest because nearly everything has been privatized. Because economic power is more important than military power in most situations, the State Department and the Department of Commerce take the lead in crisis resolution, thereby leaving the secretary of defense out of most decisions until conflict erupts. Because the *Zaibatsu* believes anti-satellite (ASAT) systems and submarines are destabilizing to the peaceful economic uses of space and the oceans, these weapon systems are officially prohibited. However, suspected cheating by some leads to covert ASAT and submarine programs by many. Finally, the geographic CINC system is replaced with standing joint task forces.

Clearly, *Zaibatsu* is a very challenging world for the military and contains aspects not present in any of the other future operating environments. Additionally, each of the other future worlds also contains aspects not easily represented by the future operating environments. For instance, in *Gulliver's Travails*, a rise in nationalism spawns terrorism in the US involving weapons of mass destruction. The wild card of a chemical weapon terrorist attack on US soil inflicting 150,000 casualties motivates the US to become globally involved. This wild card is combined with the current trend of balkanization to create a world in which the US is heavily engaged worldwide. Although this challenge is captured in the future

operating environments, what is not captured is the concomitant high operations tempo in this world. The challenge in *Gulliver's Travails* is to fight terrorism while being nearly overwhelmed with worldwide commitments.

Digital Cacophony contains the challenge of a fast-moving, technologically driven world where military threats are primarily dealt with using on-line virtual forces as opposed to forces providing physical presence. This world is created by combining several wild cards with the current trend towards increased information and communications connectivity. The wild cards are a genetics breakthrough yielding abundant food and a high-energy-radio-frequency attack wave that destroys Wall Street's financial databases. This information warfare attack against US economic assets is met by increasing the military's roles. Cyberspace warriors become the primary frontline protectors of US security.

King Khan is somewhat similar to the high end global competitor (also known as a superpeer competitor) of the future operating environments, but adds the aspect that the US is far less capable than today because of internal domestic concerns, and thus is greatly outmatched by the superpower. In *King Khan*, the US has no peer; Khan is vastly superior but seems benign. The wild card in this alternate future is a collapse of the Mexican economy which generates excessive demand on US social systems because of an influx of illegal immigrants. This increased demand results in a US depression which lasts nine years. During this period, US military forces are slashed to a third of today's forces. The military challenge in this world is to determine which core competencies to retain and which capabilities to reconstitute once economic recovery begins.

The worlds of *Halfs and Half-Naughts* and *2015 Crossroads* present many of the challenges present in the other four alternate futures, with the exception that *2015 Crossroads* contains a major regional conflict where airpower has to "go it alone" due to time constraints and the main belligerent's threat of using weapons of mass destruction. *Half and Half-Naughts* experiences as a wild card a California earthquake that kills 150,000 and leaves millions homeless. This event forces the US to look inward temporarily to solve a significant domestic problem. The US focus is pulled outward when China seizes the

Spratly Islands. In *2015 Crossroads*, the death of Saddam Hussein sparks a series of events which leads to a major regional conflict. Each of these worlds poses new challenges not completely captured through the future operating environments approach. In addition, each contains sufficient detail to create a rich war-gaming environment.

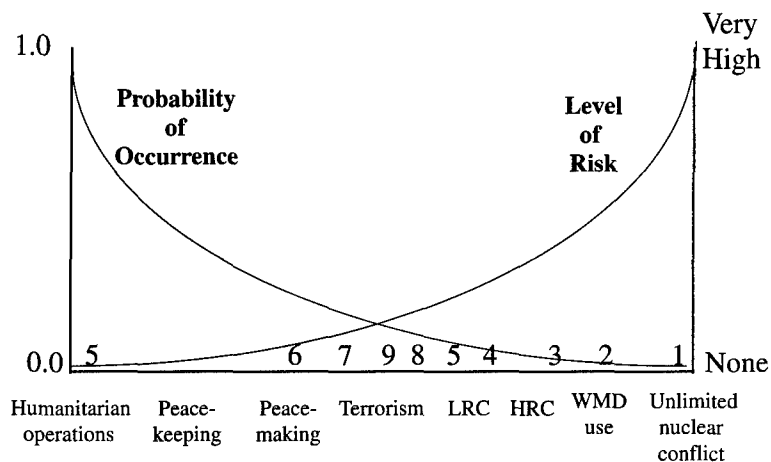


Figure A-8. Spectrum of Conflict

- | | |
|---------------------------------|--|
| 1. High end global competitor | 6. Peace enforcement |
| 2. Low end global competitor | 7. Dangerous nuclear/
industrial activities |
| 3. High end regional competitor | 8. Large-scale NBC proliferation |
| 4. Low end regional competitor | 9. Nonstate terrorism |
| 5. Counterinsurgency | |

Across the Spectrum of Conflict

Future operating environments can be thought of as types of military operations or levels of warfare. Future operating environments appear to be military operations which can be depicted along the spectrum of conflict, as shown in figure A-8.

The depiction of the future operating environments across the spectrum of conflict represents a “best-guess” and “first-cut” at this exercise. Of note and interest is the scarcity of future operating environments at the lower end of conflict.

Even though the level of risk to national survival is very low at this end, notice that the probability of occurrence is very high. Further, the risks to interests may also be high and increasing if the relatively more benign alternate futures prove more likely. Under future fiscal constraints, it is not clear that the right types and numbers of forces will be available to conduct operations such as humanitarian relief, foreign assistance, and peacekeeping unless the US plans for them. These are levels of military operations that could present very challenging conditions to US forces, especially in a world of high operations tempo such as in *Gulliver's Travails* and *2015 Crossroads*.

Alternate futures can be "mapped" across this same spectrum of conflict as shown in figure A-9. Notice that the entire range of military operations are represented by the set of alternate futures. Also of interest is the amount of overlap at certain points along the continuum. These areas of interest give insight as to the weight of effort or concern that should be applied to various military operations. The difficulty with

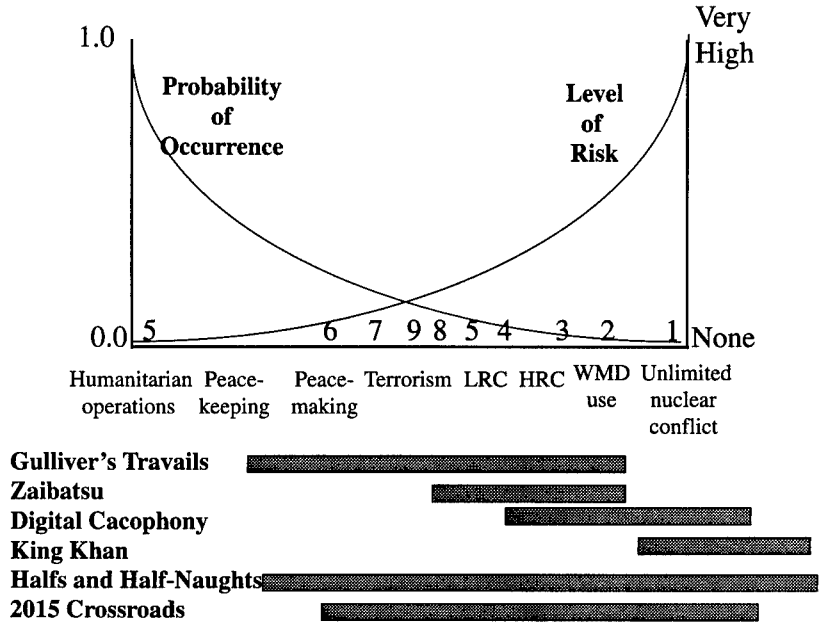


Figure A-9. Alternate Futures and Spectrum of Conflict

future operating environments is that no such weighting is implied. This observation provides additional rationale for using alternate futures in long-range planning.

As seen in figure A-9, each world can be characterized by the range of military operations that have occurred or are likely to occur. Taken as a set, they represent a full range of military operations that future forces and organizations need to be equipped to handle. Of some interest is to note that the last two worlds created, *Halfs and Half-Naughts* and *2015 Crossroads*, were requested so that less “extreme” worlds would be available for planning. Figure A-9 illustrates that the worlds may be less extreme, but there is a higher likelihood for a broader range of military operations to occur in these worlds than in the others. This fact, in and of itself, makes the last two worlds at least as challenging as the original four (corners of the box).

Figure A-9 provides a good framework for comparing future operating environments and **2025** Alternate Futures. It is obvious that each alternate future contains multiple future operating environments and that each future operating environment can occur in more than one alternate future. Thus it is clear there is a connection between the two, but they are not the same thing. Since alternate futures already contain plausible histories which can be used as a lead into a war game and provide sufficient detail to create a ready-to-use scenario, it seems logical to use alternate futures as the mechanism for conducting war games to discover challenging environments. In many cases the new environments or strategic challenges will mirror the future operating environments, but it is likely that in some cases new ones will be discovered. The end result of using the **2025** Alternate Futures, which by their nature contain future operating environments, will be a better learning experience for the senior decision makers, which will lead to richer thinking and more robust choices.

Internal Consistency as a Critical Metric

The most important distinction between **2025** Alternate Futures and techniques such as future operating environments

or other forms of scenario or future building is the key metric of internal consistency. When planners use internal consistency as a key metric, they make conscious judgments about the causes and effects of forces at work in shaping the organizations' operating environment. Planners also clearly identify the linkages between these forces so they better understand and gain insight from the environment. One can imagine a global American worldview. One can also imagine a severe downturn in American fiscal health. But, American support for global military involvements when faced with severe recession or even depression is not very plausible. By testing for such inconsistencies and removing them from alternate futures, planners not only create more plausible scenarios, they clarify their understanding of the linkages, in this instance, between widespread external military activity, public support, and fiscal well being. Future operating environments which use key actors as "drivers" and fail to accomplish such rigorous tests require that the users specify how to accommodate for internal inconsistencies.

A corresponding benefit to using alternate future drivers and internal consistency is the new insight into relationships and interactions the method offers. Using drivers to develop a named world creates a clear "logic of the model." The value of a model is that it clarifies the conditions under which key features interact. Thus, in the logic of the *Digital Cacophony* model where all Americans are "wired," the potential for direct individual involvement in American governance is greatly enhanced. In fact, the future describes a netocracy where voters vote on policy issues rather than for elected representatives. This model suggests a future insight that planners might explore; fickle voters might cause greater fluctuations of policy than a more muted representational system. In contrast, the economic concentration of power in *Zaibatsu* creates a different model even though Δ TeK is also exponential. Corporate interests would seek to mute political volatility by increasing the apparent power of political representatives and channeling a high-tech populace from being wired into the political process directly. Such insights may not be directly relevant to near-term military planning, but they provide a rich detail about possible relationships in a

plausible future that deserve modest exploration to avoid shock and surprise in the long term.

Some might have argued that the economic and social changes occurring in the Soviet Union during the 1970s and 1980s were minor details in terms of military planning. Yet, such details and the declining legitimacy of the Soviet Communist Party combined to change the strategic landscape. Understanding the consequences of rich planning details can minimize surprise.

"The Devil Is in the Details"

One additional advantage of alternate futures is their richness in detail. Many types and levels of detail have already been developed for the six alternate futures, but the real advantage is that unlimited detail can be added. By using the three drivers and analyzing their interaction, planners can easily infer additional events and details in each world. In contrast, once future operating environments have been constructed, it might be more difficult to infer additional information without the assistance of the script writers.

As an example, a new piece of knowledge about one of the worlds can easily be created. Any relevant subject can be selected and enriched in any of the six worlds. For instance, envision the nature of strategic attack in *Gulliver's Travails*. This is a world where the American worldview is Global, Δ TeK is Constrained, and the World Power Grid is Dispersed. Because Δ TeK is Constrained, strategic attack methods and targets are generally limited to those which exist today. It can be postulated that no new ways will be discovered that can paralyze and defeat an adversary. In fact, the nature of conflict in this world, involving rapidly shifting alliances and small terrorist groups, indicates that the use of strategic attack may be severely limited by political and military realities. For instance, the US might not want to destroy a country's electrical power system, because in six months that country could be a coalition partner in a different conflict. Additionally, the destruction of the electrical power system would do little to deter a nationalist movement which uses terrorist attacks against its own people and neighbors. Finally, the combination

of a dispersed World Power Grid and constrained Δ TeK leads to a world where most conflicts do not involve a highly industrially developed state that can be attacked at the strategic level. Taking all of the drivers into consideration leads to the conclusion that strategic attack will have limited utility in this world; thus a B-3 bomber would not be a high-priority weapon system to develop or procure.

It is clear from this simple example that the amount and level of detail that can be added to alternate futures are nearly boundless. To attempt to write the same level of detail into a future operating environment would be time-consuming and frustrating. The result might be scenarios that do not fully capture all of the aspects of that future environment necessary and useful to the decision makers. In order to make the scenarios usable, they must lend themselves easily to the inclusion of additional levels of detail.

Conclusion

This appendix discusses Air Force long-range planning efforts and attempts to present some rationale for institutionalizing long-range planning in the Air Force. Additionally, it presents the linkage and differences between alternate futures created by the **2025** study and future operating environments created by the Air Force Long-Range Planning Office. The crux of this discussion is that long-range planning is vitally important to ensure the US maintains the dominant air and space forces of the future.

Notes

1. Besides the **2025** study, there have been the *New World Vistas* study effort by the Air Force Scientific Advisory Board, an effort sponsored by the Air Force director for long-range planning (AF/LR), and a study under way at the Rand Corporation.

2. Message, 231848Z DEC94, CSAF to Air University commander, 23 December 1994.

3. Some make a useful distinction between strategic planning and long-range planning. Often strategic planning is assumed to be mid- or near-term planning that uses analytical techniques to link the organization's goals with the next series of incremental improvements toward those goals. The Air Force strategic planning model taught in the Air Force Quality

program and the Mission Area Plans Process are examples. These forms of planning are important but fall short of the jump shift changes that allow an organization to significantly alter its direction to seize new opportunities or respond to new challenges that future circumstances promise. When this critical element of planning is incorporated, effective strategic planning converge. Note the deficiencies observed by Captains Whiting and Dale who concluded that Air Force long-range planning was handicapped when it was forced to try to affect near-term planning too directly. It is also interesting to note that cold war long-range planners believed they had learned an important lesson that to preserve the long-range planning function that it must be linked to near term allocation decisions. See, Perry M. Smith et al., *Creating Strategic Vision: Long-Range Planning for National Security* (Washington, D.C.: National Defense University Press, 1987). The Joint Staff's long-range planners have still not unlearned this lesson despite the end of the static cold war environment and the more unpredictable future which confronts current planning. Presentation by Joint Staff planner to the Air War College under a policy of nonattribution.

4. Martin C. Libicki, "The Armed Forces 2020," unpublished paper, 16 January 1996, 1.

5. Ibid.

6. Ibid.

7. Remarks by several members of the "ExCom," the vice commanders of the Air Force major commands following the Alternate Futures team presentation on 10 January 1996 via videoteleconference from Maxwell AFB, Gunter Annex, Ala.

8. Libicki, 2.

9. Gary Sycalik, lecture on "wild cards" to **2025** participants, 6 September 1995. Dr Sycalik discussed several examples of wild cards. Some of these examples were specific US internal problems (health care system bankruptcy, internal terrorism, government bankruptcy), catastrophic world events (massive meteor strike, plague-like disease), technological developments (micro-electrical mechanical systems, new-wave physics, artificial intelligence), warfare (ecological, psychotronic), and "positive" wild cards such as zero-point energy and cultural diversity value recognition.

10. A variant or blend of these first two models was recommended by RAND in 1976. Simon et al. suggested functional research and development planning should be done at the major command level and a special cell on the chief's personal staff should do long-range planning. W. E. Simon et al., "Long-Range Development Planning in the Air Force," RAND Report R-1989-PR (Santa Monica, Calif.: RAND, September 1976).

11. Herman S. Wolk, *Planning and Organizing the Postwar Air Force* (Washington, D.C.: Office of Air Force History, 1982).

12. Col Alan L. Gropman, noted in "Air Force Planning and the Technology Development Planning Process in the Post-World War II Air Force—The First Decade (1945–1955)" in *Military Planning in the Twentieth Century* (Colorado Springs, Colo.: US Air Force Academy Library, 1984).

13. The OSD Office of Net Assessment has sponsored a series of war games to explore the potential for a revolution in military affairs. All of the services have participated.

14. Richard Cyert and James March, *A Behavioral Theory of the Firm* (Englewood Cliffs, N.J.: Prentice-Hall, 1963).

15. Members of the **2025** Executive Committee have pointed out during the study how much they like the "virtual" meetings conducted through videoteleconferencing that were a large part of the **2025** study effort. By not having to come TDY to Maxwell AFB for a one-day conference, they have saved two days of travel time. Further, the Military Health Services System 2020 study has demonstrated how technology can be used to decentralize discussion and concept development. Such technology should be highly valuable for future planning efforts.

16. Libicki, 16.

17. "Air Force Long-Range Planning Board of Directors Read-Ahead Material," sponsored by the special assistant to the chief of staff for Long-Range Planning (Washington, D.C.: 29 February 1996), tabs 4 and 5.

Appendix B

Trends

Some of the future is knowable. When causes are known and slow to manifest, one need only watch to see the results revealed. The population size of a group is an example of one aspect of the future that can be predicted with a high degree of accuracy. Variables such as changes in birth rates over time, migration, and disease allow scientists to attach a range to their predictions. Anticipating how these variables will change outcomes over time is the art and science of predicting future trends. Many engage in such prognostications when the trends are linear and the causes and variables are understood. In these cases, future trends are quite predictable and worth foretelling. Some, however, predict about nonlinear or poorly understood events. One should discern between knowable future trends and the prophecies of oracles.

Futurists, seers, and prognosticators of all sorts have used trends as the basis of predicting the future. Of course, extending trends into the future does not necessarily reward one with accurate predictions. For instance, 73 individuals gathered at the World's Fair in 1893 to make predictions about 1993. Some of their inaccuracies included predictions that people would live to be 150, the government would grow smaller and simpler, and prison populations would decline as fewer crimes were committed.¹ The reader should be cautious and judge if trends describe knowable and sufficiently linear events.

This appendix describes some of the general trends that served as background material in developing the **2025** worlds. Though some overlap is inevitable, the following categories are broad and simple, and they introduce the reader to the trends woven into the fabric of the alternate futures. The categories are computer hardware, computer software, space, communications, the media, nanotechnology, medicine, energy, international relations, the environment, education, world population, and economics.² The one exception to the criteria of simplicity, or recognizability, is the field of nanotechnology—the ability to make things extremely small. This field has currently received little notoriety, but has the potential to

affect most fields of science and technology. Nanotechnology will spawn revolutionary changes in the way humans conduct their lives and businesses.³

A more extensive list could have been compiled, but such a list would constitute a separate and lengthy volume in and of itself. Note that a disproportionate amount of text will be allocated to the environment and the last two categories. The environment receives extensive attention because it either impacts or is impacted by the number of people, where they live, and how they exploit the resources available to them. One good reason to examine demographics and economics is that these areas are particularly susceptible to statistical analyses.

Computer Hardware

This paper addresses two factors regarding computer hardware. First is the rapid evolution in the technology itself, so rapid it effectively renders systems obsolete within a year or two of introduction. Second is computers' impact on job production for the economy.

Over the last decade, the rate of increase in the speed of the central processing unit (CPU) of personal computers has risen from doubling every two years to doubling every 18 months.⁴ Considered from the viewpoint of 1986, that increase in the rate of change means the computers projected for the year 2000 are already available in the year 1996. Such accelerations in growth rates would be typical in a world experiencing exponentialⁿ Δ TeK. This rate of doubling is known as "Moore's Law," and was postulated in 1965 by Gordon Moore, cofounder of Intel.⁵

Microprocessors continue to evolve at exponentially increasing speeds (fig. B-1). "Today's microprocessors are almost 100,000 times faster than their Neanderthal ancestors of the 1950s, and when inflation is considered, they cost 1,000 times less."⁶ Extrapolated 15 years, that rate of change in processing power produces a computer 1,000 times faster than current hardware, and 30 years at that rate would produce CPU speeds 1 million times faster than 1995 processors, but at the same price. Of course, the nature of lithographic processes limit current technologies from achieving such clock speeds. However,

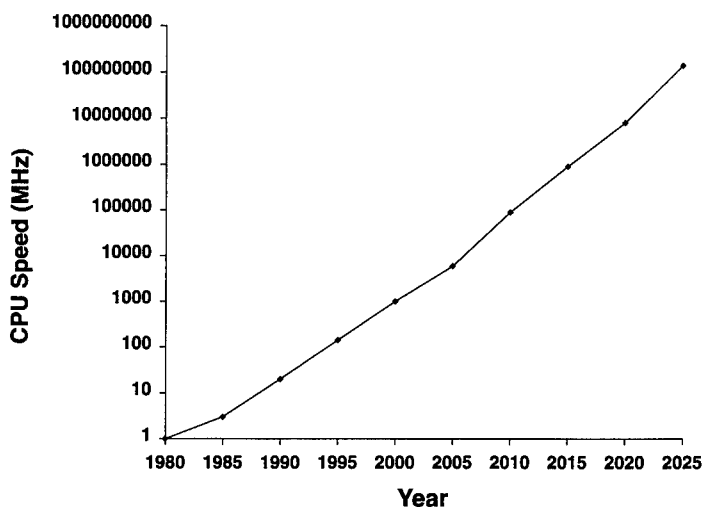


Figure B-1. Approximate Rate at Which Speed of CPU Increases
 (Based on Moore's Law and 1995 CPU speeds of approximately 150 MHz)

advances in technology, such as pipelining or parallel processing,⁷ may eliminate some of those barriers.⁸ In essence, the desktop computer of 2025 unarguably will be more powerful than today's Cray supercomputers.⁹

The advent of this ever-more-capable hardware impacts job security, status, and levels of compensation.¹⁰ Developments in computer hardware have provided career opportunities for some, such as local area network (LAN) experts, but have negatively impacted other career fields. For instance, auto mechanics have gone from the role of well-paid specialists to mere technicians who remove and replace parts identified by a computer.¹¹ Robotics in the auto industry have eliminated high-paying assembly-line jobs, often relegating individuals to minimum wage jobs.¹² Remarkably, the LAN experts may be the next victims of continued advances, as plug-and-play software and hardware eliminate the need for individuals who can develop workarounds to connect disparate packages.¹³ It is similar types of economic upheaval in *Digital Cacophony* that lead computer engineers to sabotage the net, in response to losing their jobs to artificial intelligence.

Computer Software

Software provides a tool to control computer hardware. This section discusses some impacts of software development, as well as some of software's vulnerabilities. Software is not immune to the vagaries of the computing environment, as emphasized by the proliferation of computer viruses. Where viruses strike productivity suffers, and hardware can even be destroyed.¹⁴

Sophisticated software now impacts the livelihood of various workers, including professionals and sportsmen who may have thought themselves immune from such invasions of their working environment.¹⁵ Programs such as Parson Technology's Personal Tax Edge® make it possible for untrained taxpayers to assess complex tax issues such as alternative minimum tax payments, depreciation of rental property assets, and how to carry forward losses from a previous year's tax return.¹⁶ Similar programs allow consumers to write living wills and powers of attorney that are recognized in many states.¹⁷ These programs do not "mean the end of the knowledge worker. It just means that different knowledge will be valuable."¹⁸ The bottom line, however, is that certain "cookie-cutter" functions of the professionals can be replaced, so certain professions can expect to see a decline in the number of practitioners or to receive lower levels of compensation.

Software has even intervened in the world of sports. International Grand Master and Professional Chess Association World Champion Garry Kasparov recently played a chess match against a supercomputer, Deep Blue. Deep Blue won the first game, then drew the next two games before the human won and evened the score.¹⁹ Though Kasparov went on to win the match, it is considered only a matter of a few years before computers can defeat any human competitor.²⁰ The reason computers perform so well is not a capability to plan better than humans. Instead, the computer is capable of analyzing a large number of moves very swiftly.²¹ Positional assessments, however, have historically been one of the computer's weaknesses, and that is what eventually led to Deep Blue's downfall.

Computer viruses can subvert data, alter the flow of money, sniff out passwords, and conceivably arm, disarm, or retarget weapons.²² In general, the normative problem is the loss of productivity caused by viruses that spread across under-protected networks in the work environment.²³ To date, the impact is relatively innocuous because most virus writers are inexperienced, amateur programmers with few skills. What is to be feared in the future is the sophisticated code writer with both more insidious purposes and means. Such an individual may imperil financial markets, weapons systems, or network security.

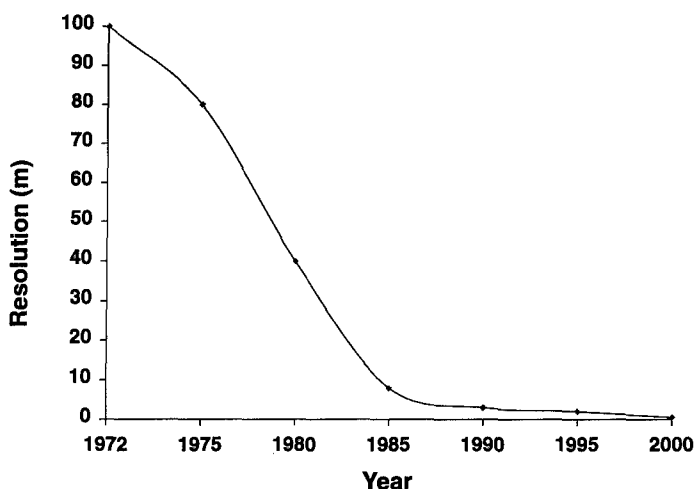
Space

Space control, as a concept, is the twenty-first century equivalent to the concepts of Sea Control and Sea Denial used by major naval strategists of Britain, France, and the United States during the eighteenth through the twentieth centuries. . . . It will be a major challenge for our forces to sustain the ability to control or deny access to space-device gathered intelligence, especially with transnational commercial proliferation of such devices. Such capability will require a coordinated combination of political, diplomatic, and military strategic policies.²⁴

This section briefly addresses future uses of space and some concerns regarding the US's ability to maintain space dominance.

What seems certain about the exploitation of space is that the military will grow more dependent on space assets and commercial developments in space.²⁵ Direct military applications might include the placement of directed-energy weapons on satellites.²⁶ Exploiting commercial space technologies may be even more crucial to the DOD's future. In eras of possibly declining budgets, the US military will rely on leveraging high-technology commercial programs in order to sustain a substantive capabilities edge versus potential aggressors. This commercial research might include developing new materials on space stations by 2005.²⁷ Though precise applications obviously cannot be provided for these supposed developments, it is sufficient to presume that the military dare not forgo the opportunity to leverage new technologies lest a competitor gain an edge.

While potential military applications are of longer term interest, US strategic and operational security issues are an ongoing concern as commercial and foreign space ventures develop intelligence-gathering capabilities once the sole domain of the DOD. This problem was exacerbated in the 1990s by the Russians and Chinese entering the commercial space markets as a means for generating hard currency.²⁸ For instance, designers plan to provide one-meter resolution photos from commercial satellites by 1999 (fig. B-2); Russian imagery is already available with details down to two meters, though the images are historical.²⁹ Operational issues are involved, because not only will such images provide any paying customer the ability to find targets, but precision targeting may be available from Global Positioning System satellites. Currently a hand-held "receiver can deduce its position to less than 5 meters by comparing signals received simultaneously from up to six different satellites—and the accuracy will soon be measured in centimeters."³⁰ The mixture of accessible satellite imagery and a precision targeting mechanism implies a formidable threat to the operations of US forces abroad, and even to the populace of the continental United States if combined with a ballistic missile capability.



Source: Institute for National Strategic Studies, *Strategic Assessment 1995* (Washington, D.C.: National Defense University, 1995), 155.

Figure B-2. Civilian Satellite Ground Resolution

Communications

Communications security issues impact bandwidth³¹ and the ability to operate in remote locations while denying that capability to the opposition.

"It is important to note that there is a tradeoff between high bandwidth and secure communications; security, particularly antijamming, requires redundancy and error-correction data, resulting in lower throughput (i.e., lower usable bandwidth)."³² Adm William A. Owens, for one, feels that the trend favors those who seek to increase security.³³ For instance, a fiber-optic cable has characteristics that make it difficult to tap undetected. By the year 2000 one estimate is that communications should have reached a rate of one terabit³⁴ per second over a single fiber.³⁵ Consequently, bundles of fiber-optic cables would provide a relatively secure means of communication with tremendous bandwidth. Of course, that technology benefits potential enemies as well as the DOD.

Current and future realities are that operations in remote locations will require robust and reliable communications via commercial satellites. As a result, an enemy who knows which commercial satellites are being used by the American military could lease channels from the same source, thereby providing a level of sanctuary to their communications base. Even if satellite links are disrupted, it may be difficult to prevent an enemy from receiving information about the positioning of forces in a conflict if, as some suggest, the information and communications picture of the future is dominated by a worldwide decentralized network of interconnected webs.³⁶ Of even greater concern is that this ubiquitous network is particularly susceptible to attack inside the US.³⁷

Media

It is safe to assume the omnipresent eye of the CNN camera will be an integral part of any future military operation. Hundreds of millions of people worldwide will judge the appropriateness of everything an air commander does.³⁸

Traditionally, the media have not exerted much influence with respect to fundamental American attitudes and beliefs, but the media "can be important in influencing opinion on

particular issues (especially network television)."³⁹ In 1968, Walter Cronkite's opinion that North Vietnam could not be defeated sent shock waves through the White House, by some accounts contributing to President Johnson's decision not to stand for reelection.⁴⁰ Media impact may become even more important under the dual influence of technology and the development of adversarial or "new" journalism. This "new" breed of journalist is said to be most concerned with discovering "truth" rather than uncovering "facts," a significant change from the twentieth century standard of impartiality.⁴¹ The combination of 24-hour, worldwide coverage and "new" journalism will present endlessly evolving challenges to leaders attempting to implement a particular policy or to achieve some specific military or economic objective. The Toffler's, in fact, note that broadcasts during combat operations, via commercial satellites, may "alter the actual dynamics and strategies in war."⁴²

Of crucial import to alternate futures such as *Gulliver's Travails* and *Digital Cacophony* is the notion that the spread of new media forms, such as satellite broadcast access and bulletin boards on the Internet, tends to undermine central control, dispersing power towards ever smaller groups.⁴³ This breakdown of central control is not confined to just new forms of media interaction. Activists such as Steve Dunifer are currently taking advantage of advances in technology to aid individuals in setting up pirate radio stations. It is possible to distribute the parts for a 30-watt radio transmitter⁴⁴ inside a suitcase, at a minimal cost. These operations are so small and difficult to control that they usurp the Federal Communications Commission's monopoly in the United States and threaten government control of information in several one-party foreign states.⁴⁵ In the future broad-band communication capabilities, supported globally by seamless satellite, fiber, and wireless links, will empower individuals in the information and communications domain as never before.⁴⁶

Reflecting trends towards demassification and individual access to multiple means of communication, the media will also learn to design its message for the individual consumer, using commercial and government databases to surround

each individual with a personalized news and advertising presentation.

What is the impact of burgeoning media presence on military operations? Lt Col Marc D. Felman suggests that combatant commanders might add a new principle of war:

Media Spin—pay close attention to public relations, recognizing that public support is an essential ingredient of combat success. Aggressively ensure that media portrayal of combat operations is neither distorted nor misrepresented through press omissions. Above all, safeguard the safety of the troops and operational security but do not lie to the media merely for [the] sake of convenience. Never take for granted how combat operations will be portrayed in the news. Avoid operations that will swiftly turn public support away from the war effort and capitalize on success stories by ensuring they get maximum exposure. In an age where 24-hour instantaneous battlefield news coverage is a fact of life, paying attention to media spin is of paramount importance. For a combatant commander, anything less would be irresponsible.⁴⁷

Nanotechnology

“Nanotechnology will influence society as dramatically as the discovery of fire, writing, and agriculture put together.”⁴⁸ Nanotechnology appears to have revolutionary applications across the depth and breadth of engineering, from computers to medicine to materials science.⁴⁹ What is nanotechnology, and how will this field impact the technologies of 2025?

The apex of nanotechnology is engineering at the molecular or even atomic level to create structures at the ultramicroscopic level, structures that can then be plugged together like Lego blocks at the designer’s whim. The structures created might even be self-organizing, aligning themselves in response to external stimuli.⁵⁰

A self-organizing nano-structure offers untold opportunities to expand present capabilities in a variety of fields. Eric Drexler of the Institute for Molecular Manufacturing in Palo Alto, California, states that building a computer atom by atom would offer more processing power in a desktop package than all the computing power created to date. At the large-scale industrial end of the spectrum, Drexler speculates that by arranging atoms in a precise fashion a material might be developed with “100 times the strength-to-weight ratio of steel.

Thus, automobiles or anything else made of today's steel could be 10 times stronger and 10 times lighter at the same time."⁵¹ In the medical field nano-devices might be designed to act as cancer leukocytes. In the transportation safety field a wisp of molecules might respond to a collision in a manner that controls the rate of the deceleration forces that currently cause much of the harm to humans.⁵² Another proposal posits the development of swarms of nano-devices that act to screen cities from various forms of viral, conventional, or informational attack, as well as providing a means for distinguishing between denizens of the city versus intruders.⁵³ That concept is used in *Digital Cacophony*.

Medicine

"In 25 years the human genome—the DNA encyclopedia of our genetic code—will have been mapped, and we will be applying that knowledge to diagnostics, treatment of disease, manipulation of our bodies, and even behavior control."⁵⁴ At the simplest level, this knowledge will allow the identification of individuals at risk for many diseases, and subsequent modification of behavior or therapeutic intervention.⁵⁵ Some prognosticators even project that new organs will be grown from the patient's own tissue as early as the year 2015, while others predict that diseased organs will be regenerated, rather than replaced.⁵⁶ Another aspect in the pending medical revolution is that automation will replace the current plodding trial-and-error research process of developing drugs based on plants. Automating the testing of reactive properties of plants means that researchers can reach out past the one-half percent of plant species that have been studied to date.⁵⁷

Energy

By 2025 the worldwide demand for fuel is projected to increase by 30 percent and that for electricity by 265 percent. Even with more efficient use and conservation, new sources of energy will be required. Solar energy could provide 60 percent of the electricity and as much as 40 percent of the fuel.⁵⁸

Finding alternate sources is important due to environmental concerns, as well as for the US to reduce its reliance on

Persian Gulf oil reserves.⁵⁹ This appendix discusses two potential replacement energy sources: fusion and solar power. Some other sources are "biomass (using a crop like corn to make fuels like alcohol),"⁶⁰ geothermal, hydropower, waste-to-energy, and wind.

Marvin Cetron speculates that commercially viable fusion reactors will be available after 2010, and a major source of power by 2030.⁶¹ Others suggest that practical, commercial applications of fusion will not arrive until 2045.⁶² In the alternate futures of this study, *Digital Cacophony* and *Zaibatsu* represent worlds wherein commercially developed fusion is representative of the revolutionary nature of Exponentialⁿ Δ TeK.

Solar power is a technology that is finally becoming economically competitive. That competitiveness was fostered by a 40-fold decrease in the price of generating photovoltaic power from 1979 to 1989.⁶³ Eric Drexler suspects that nanotechnology might lead to breakthroughs in solar technology producing costs "significantly less than central-plant-produced electricity."⁶⁴ Even now, predictions indicate that solar power will be competitive with conventional generation shortly after the year 2000.⁶⁵ These and similar renewable technologies are crucial elements in the environmental planning strategies of worlds such as *Gulliver's Travails* and *2015 Crossroads*. Returning to the quote that opened this section, however, note that solar energy is not sufficient to meet all the projected energy requirements of 2025. Coal- and oil-powered energy plants will still be required.

International Relations

Most commentators predict that the number of nation-states will continue to grow (fig. B-3). Secretary of State nominee Warren Christopher, in Senate confirmation testimony, underscored the seriousness of the situation by noting that the world might soon have 5,000 nations unless people put aside ethnic differences.⁶⁶ Even if states do not proliferate to such an extent, individuals such as Riccardo Petrel, the director of science and technology forecasting for the European Community, predict that states will continue to lose relative power as new actors dominate the socioeconomic

stage. Petrel predicts that multinational corporations will ally with city and regional governments to dominate the decision-making processes.⁶⁷ The role of nongovernmental organizations will also continue to flourish—both benign groups such as the Red Cross and Greenpeace, and malign groups such as drug cartels and terrorists. The latter groups will use technology to link resources and shield their dominions.⁶⁸

The increasing volume of trade between nations, as a percentage of each nation's economy, creates a growing interdependence that analysts such as Peter Drucker perceive as determining the characteristics of relations between groups

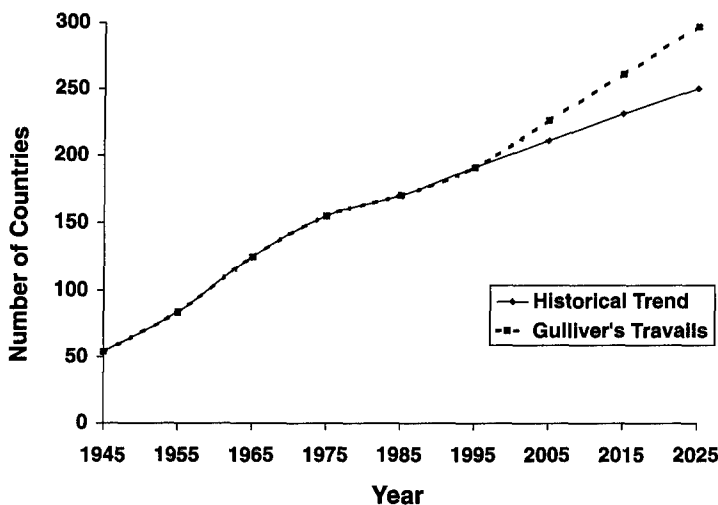


Figure B-3. Independent States, 1945–2025⁶⁹

in the future.⁷⁰ Some individuals predict that future wars will be small and regional in nature because major military conflicts are contrary to international trade and “the well-being of the trading nations.”⁷¹ Others argue that strife might become more common, because the gap between the haves and have-nots is going to continue to grow.⁷² The Tofflers also dispute any utopian vision, noting that in 1914 Britain and Germany were each other's largest trading partners, yet they went to war. The Tofflers suggest that

interdependence creates complexity, which can lead to unexpected effects because no one can predict how an input to one part of the system will impact outputs elsewhere. Their thesis is that unintended consequences can make the world more dangerous.⁷³

Environment

Environmental problems are unlikely to be the proximate cause for conflicts. . . . Most pollution, resource, and population problems take decades to unfold. Their effect also depends upon the adaptive capacity of nations and societies; it would be inappropriate to jump from environmental trends to predictions about impending conflict. In most cases, environmental problems aggravate existing political disputes, rather than being the immediate cause for conflict. An exception to this rule could arise from water disputes over the Euphrates River involving Turkey, Syria, Iraq, or Iran.⁷⁴

Though environmental degradation may not directly cause conflict in a region or local area, it can contribute to population and resource pressures that could lead to destabilization of society and civil authority, especially if the environmental degradation can be linked to specific groups.⁷⁵ Of greater international concern, however, is the impact of global environmental change, generated by human activities, on the well-being and security of the world community. The following human-induced environmental changes have already endangered the global commons and the future stability of the world; their impact will be felt for decades and potentially for centuries to come:⁷⁶

1. Degradation of air and water quality, especially that associated with acid deposition from fossil fuel combustion.
2. Massive ozone depletion over the Antarctic and lesser decreases over the rest of the globe, both attributed to emissions of chloro-fluorocarbons.
3. Deforestation in general and large-scale destruction of tropical forests.
4. Global warming and climate change due to rapid changes in the global atmosphere caused by fossil fuel combustion and industrial activities.

Pollution will increase in varied sectors. For instance, acid rain will be a continuing problem as industrializing countries choose not to hurt profits by installing emission-control equipment.⁷⁷

Acid rain can "seriously affect soil properties, agriculture, certain sensitive inland fisheries, and coniferous trees."⁷⁸ Often, the first victims will be the forests and animals located where the acid rain falls, sometimes thousands of miles from the pollutant's origin. In 1996 Dr Adrian Frank indirectly linked acid rain to moose deaths in Sweden. Lime was being used in the forests to counteract acid rain damage, but when moose ingested the lime while eating foliage, they unexpectedly experienced a toxic liver imbalance of copper and molybdenum.⁷⁹ Such unintended consequences are representative of the problems experienced in *Digital Cacophony*, wherein solutions to one problem generate unexpected side effects.

Meanwhile, the ozone layer is being depleted, increasing the risks of skin cancer and other skin diseases for humans and farm animals.⁸⁰ Despite the Montreal Protocol on Substances that Deplete the Ozone Layer,⁸¹ the use of technology based on CFCs is likely to continue into the twenty-first century. As a result, the ozone layer could not fully regenerate until at least the twenty-second century because CFCs take a century to settle out of the atmosphere.⁸² What is driving the continued use of these ozone-depleting chemicals?

The problem is that developing nations are attempting to modernize, and CFCs are cheaper than alternative technologies. For instance, the Carrier Corporation has tripled sales of air conditioners to Asia since 1986 and now believes that by 2000 Asia may account for half its sales.⁸³ This "pell-mell chase after refrigerators"⁸⁴ will likely involve use of CFC technology. In response to charges that they are violating the Montreal Protocol, the Chinese reply that other countries must provide technical and financial assistance if China is to develop alternative, non-CFC technology.⁸⁵

This is the type of ecologically interdependent economic policy that contributes to international strains in several of the alternate futures. Of course, the problem is not restricted to industrializing nations. Skyrocketing prices for CFCs have created a lucrative market for smuggling into America, according to Miami-based US Customs agent Keith S. Prager. In a recent case the owner of an American automotive air-conditioning shop was "charged with smuggling 60,000 pounds of CFCs from Mexico."⁸⁶ CFCs are also used in other fields,

such as the production of circuit boards and styrofoam packaging. Industrialists will not forsake CFCs readily as long as replacement products remain more expensive.

Humanity also acts against its own long-term interests with respect to deforestation. Though acid rain contributes to deforestation,⁸⁷ most of the destruction is undertaken to fuel agricultural expansion and economic development. The process leads to losses in plant and animal species, increases global warming and climate shifts, and over time degrades the supportability of the land due to erosion and overexploitation.⁸⁸

Species extinction constitutes an opportunity loss for humanity. This loss is reaching sizable proportions, as perhaps "15 to 20 percent of all species will become extinct by the year 2000."⁸⁹ As noted in the medicine section, half of 1 percent of plant species have been tested for medical properties to date. As a result, at the same time technology opens unparalleled opportunities, the impact of population growth and economic exploitation reduces the scope of those opportunities.⁹⁰

What are other impacts of deforestation? "On a local scale, trees protect the soil from the rain and wind that would otherwise wash or blow it away."⁹¹ At the regional level, deforestation of upland watersheds in the Himalayas is believed to have exacerbated the extent of flooding in Bangladesh. The disastrous flood of 1988 left two-thirds of Bangladesh under water and 25 million people homeless, nearly a quarter of the population. At the global level, forests reduce global warming by absorbing energy that might otherwise reflect back to the atmosphere, and by absorbing carbon dioxide (CO₂), one of the greenhouse gases. Deforestation not only eliminates these beneficial aspects but releases the stored CO₂ back into the atmosphere.⁹²

All of the above environmental topics impact global warming patterns, though oftentimes circuitously, and the extent of damage caused by all of the above can be traced to humanity. Acid rain increases rates of deforestation, thus reducing the CO₂ sink.⁹³ The contributions of deforestation to global warming already have been noted. Finally, CFCs contribute some cooling effects, but the impact is regional whereas warming is spread relatively evenly around the globe. As a

result, the differential changes in temperature gradients may alter weather patterns in unforeseen and perhaps unfavorable directions.⁹⁴ Benjamin Santer, of the Lawrence Livermore National Laboratory, developed a model that produced evidence human pollution, particularly the release of CO₂, is responsible for global warming, also known as the greenhouse effect.⁹⁵ Combining all these effects has numerous implications for future regional and global environments, but this paper only addresses the impact of global warming on flooding of low-lying lands.

One of the dire predictions tied to global warming addresses the issue of rising sea levels as glaciation recedes and the ice caps are put at risk. Since the 1890s the average global temperature has increased by about one degree Fahrenheit.⁹⁶ Santer's model predicts the temperature will rise another 2.3 degrees Fahrenheit by 2050 (fig. B-3), but others have forecast increases of five to nine degrees.⁹⁷ Some suggest that a six-degree rise would suffice to melt the icecaps, since that is comparable to temperatures that ended the last Ice Age. Such melting would raise sea levels up to three meters. Subsequent flooding in the low countries, island states, and along coasts would displace up to 100 million people.⁹⁸ Other scientists disagree with both the temperature extremes and the extent to which sea levels will rise. At least one source suggests that sea levels will rise a maximum of one-third of a meter by 2050. A one-meter rise in sea levels would find Egypt and Bangladesh among the hardest hit countries, as the majority of their populations and arable land lie in deltas that would be susceptible to flooding, particularly during storm surges. "Where the rivers are dammed, the effects of inundation and coastal erosion will be particularly severe."⁹⁹ The US would also be impacted by rising sea levels, though developed areas would probably choose to take protective measures. Conservative estimates indicate that \$30 to \$100 billion would have to be spent to protect low-lying coastal cities from a two-meter rise in sea levels.¹⁰⁰ Such infrastructure investments would obviously crimp budget opportunities elsewhere.

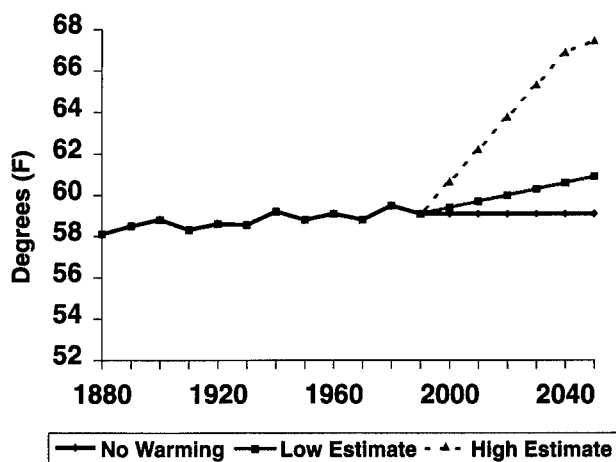


Figure B-4. Global Warming Trends (1880–2050)

Education

Education may become an area of competition, as countries steal the best ideas and techniques from each other.¹⁰¹ That is because education will remain “a major goal for development as well as a means for meeting goals for health, higher labor productivity, stronger economic growth, and social integration. Countries with a high proportion of illiterates will not be able to cope with modern technology or use advanced agricultural techniques.”¹⁰²

To enhance the competitiveness of the educational process, education may be demassified, adjusted to meet the individual needs and capabilities of the student. Furthermore, traditional methods of instruction may be replaced by interactive sessions using personal computers,¹⁰³ artificial intelligence, virtual reality, and simulations in a seamless teaching environment.¹⁰⁴ This process would be aided and abetted by feedback from analysis of the students’ cognitive processes so that the learning devices could alter strategies to best support learning.¹⁰⁵ At the very least, students will be expected to take charge of their own learning. They may meet in a traditional schoolhouse to enhance social interaction, or they may meet interactively. In any case, the decision to focus on a particular area will be

delegated to the student(s), who can engage an instructor or computer packages on an as-needed basis.¹⁰⁶

The end result of educational opportunities is often seen in impacts on population growth, along with the predicated economic consequences. These consequences will show up by comparing current enrollment trends with the projected rates of population and economic growth. For instance, in industrialized countries over 95 percent of the populace receives secondary schooling. In Latin America these rates approach 50 percent for males and females, but in other developing nations the female half of the populace often lags 10 percentage points or more behind their male counterparts in secondary school attendance rates. Formal educational opportunity has a strong correlation with birth rates, so educational opportunity differences between males and females impact the future of many areas. In Asia, enrollment for males has only recently approached 50 percent, while in Central Africa less than 25 percent of the population receives a secondary education.¹⁰⁷

Worldwide Populations

Since Malthus, scientists have speculated on the day when humanity would exceed the planet's carrying capacity.¹⁰⁸ That age may be pending. Gretchen Daily, a Stanford biologist, noted that at current rates of consumption and population growth¹⁰⁹ every drop of fresh water available would be getting used by the year 2020.¹¹⁰ This study used the highest published rates as the standard, generating a population base of approximately 10 billion in 2025. Lower rates were applied to worlds such as *Digital Cacophony*, where increased education opportunities and access to information decreased fertility rates at dates earlier than otherwise projected.

The problem of increasing numbers of people competing for scarce resources is exacerbated because "about 95 percent of the world's population growth between 1992 and 2042 will take place in the Developing World."¹¹¹ The states with such high rates of growth are the same states that cannot afford the infrastructure to support burgeoning masses of would-be urbanites seeking jobs. Nor are moves to rural areas an answer, since population pressure often leads to overuse of the

land, resulting in desertification. As a direct consequence, people must migrate to seek sustenance, adding fuel to an international refugee problem that already numbered between 20 and 40 million in 1994.¹¹² Examination of table 2¹¹³ exposes at least one potential direction of refugee flows. The population of Africa nearly triples between 1995 and 2025, while that of Europe is relatively stable.

Table 2
Population (Millions) for World Regions

	1950	1960	1970	1980	1990	Percent Growth*	Estimate 2025
World	2,516	3,020	3,698	4,448	5,292	1.7	9,547
Africa	222	279	362	477	642	3.0	1,806
N Am	166	199	226	252	276	0.8	365
Latin Am	166	218	286	363	448	2.1	927
Asia	1,377	1,668	2,102	2,583	3,113	1.9	6,015
Europe	393	425	460	484	498	0.2	534
Oceania	12.6	15.8	19.3	22.8	26.5	1.5	44.6
Former USSR	180	213	243	266	289	0.8	382

Source: *Statistical Yearbook, Thirty-Ninth Issue* (New York: Department for Economic and Social Information and Policy Analysis, Statistical Division, United Nations, 1992).

***Source:** Population Division, Department for Economic and Social Information and Policy Analysis, *World Population Growth from Year 0 to Stabilization* (New York: United Nations, 7 June 1994).

"The rich get richer, the poor have children,"¹¹⁴ and the old get older.¹¹⁵ Trends in medicine, economic growth, population density, and other areas tend to multiply the differences between the technological haves and have-nots. For instance, per capita gross domestic product in the US is projected to grow from \$25,850 in 1995 to \$37,740 in 2025, primarily as a consequence of a projected 1 percent annual population increase and economic growth averaging over 2 percent. In contrast, though Saudi Arabia is currently one of the better-off developing nations, analysts project a decline in per capita GDP there from \$9,510 to \$3,865. Their population is growing faster than their economy, which is dependent upon oil

exports.¹¹⁶ Higher relative per capita income translates into increased access to better health care. Better medicine extends lives and increases the likelihood children will survive into adulthood. The intertwined issue of economics and children is critical. Industrialized countries can rely on social programs and investment programs to provide for health care in their dotage. The elderly in developing nations rely on the good fortunes of their children "so they have as many as they can."¹¹⁷ A vicious cycle results, eroding the ability of countries to escape from the web of poverty.

Worldwide population trends will impact food, water, the environment, economic competition, and military affairs. For instance, over 3 billion Chinese and Indians (table 3) will be pressing against each other, potentially jostling for critical

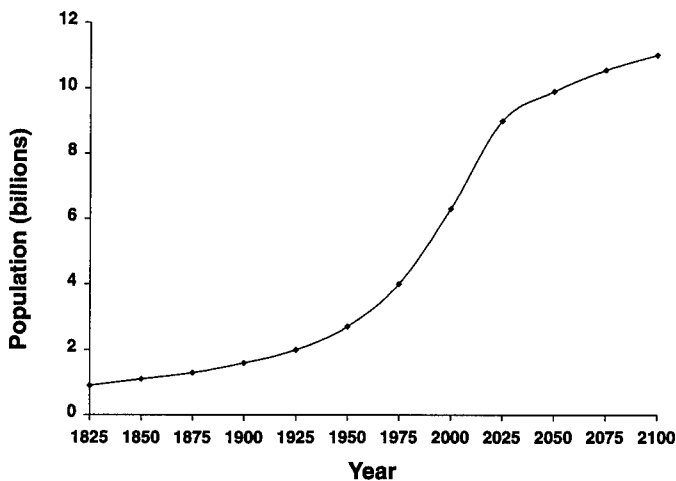
Table 3
1994 Population Figures and 2025 Projections

	Population (Millions)	Growth (%)	2025 Est. (Millions)
US	263.8	1.02	361
China	1,203.1	1.04	1,658
India	936.5	1.77	1,613
Pakistan	131.5	1.28	195
Russia	149.9	0.20	195
Japan	125.5	0.32	138
Germany	81.3	0.26	88
Mexico	94.0	1.9	168
Iran	64.6	2.29	130
Turkey	63.4	1.97	116
Saudi Arabia	18.7	3.68	57
S. Africa	45.1	2.61	100
Brazil	160.7	1.22	234
Italy	58.3	0.21	62

Source: *The World Factbook* (Washington, D.C.: Central Intelligence Agency, Office of Public and Agency Information, 1995).

resources and markets. Combining the data in these tables with those in the next section, which discusses economic trends, provides insights into where economic competition will arise in 2025 and where outward refugee flows are most likely as birth rates exceed economic growth.

Scientists such as Wolfgang Lutz, the director of the International Institute for Applied Systems in Vienna, Austria, note that fertility appears to be dropping worldwide, as depicted by the flattening of the population growth curve in figure B-5. Lutz estimates that the world's population will reach about 10 billion in 2050 and 12 billion in 2100.



Source: Daniel S. Papp, *Contemporary International Relations* (New York: Macmillan College Publishing Co., 1994), 516.

Figure B-5. Population Growth over Time

Economy

Economic forces can change political structures and the international landscape, altering relationships between nations, corporations, and individuals. Economics, therefore, ranks among the most important of trends. This study has examined growth rates of various regions of the world, and projections for their future growth, including the impact of multinational corporations. A synopsis of this material is contained in tables 4 and 5.

Table 4

2025 GDP in Billions at Various Growth Rates (FY94 Dollars)^a

Country	GDP (\$)	Growth (%)	2025 Est. (\$)	G.T. ^b Growth	2025 ^b Est. (\$)	D.C. ^c Growth	2025 ^c Est. (\$)
US	6,738.4	2.3	133,636	1.8	11,715	6.0	38,702
China	2,978.8	9.1	44,321	N/A	N/A	11.0	75,693
India	1,253.9	4.9	5,524	3.0	3,135	8.0	13,627
Pakistan	248.5	4.8	1,063	3.0	621	7.8	2,550
Russia	721.2	2.0 ^d	1,333	N/A	N/A	4.5	2,823
Japan	2,527.4	3.6	7,565	2.5	5,434	9.0	36,551
Germany	1,344.6	3.1	3,464	2.2	2,640	6.5	9,472
Mexico	728.7	2.0	1,346	0.5	851	6.5	5,133
Iran	-310	2.5	666	0.2	330	4.0	1,046
Turkey	305.2	5.5	1,604	2.0	564	6.5	2,150
Saudi Arabia	173.1	0.8	222	0.1	179	3.0	433
S. Africa	194.3	0.9	256	0.6	234	4.5	760
Brazil	886.3	2.3	1,794	1.5	1,406	6.0	5,396
Italy	998.9	2.0	1,846	1.5	1,585	5.5	5,252
GM ^e	155.0 ^f	5.3 ^g	730	1.5	246	7.0	890
IBM	64.1 ^f	3.5 ^g	180	3.0	155	12.0	8,330
Intel	8.8 ^g	20.6 ^g	3,529	8.0	103	25.0	11,107
Merck	10.5 ^g	12.8 ^g	495	8.0	123	20.0	3,589
Genentech	6.5 ^g	28.1 ^g	17,967	12.0	225	32.0	46,911
Microsoft	3.8 ^g	50.0 ^h	N/A	13.0	190	33.0	34,916

^aStatistical Abstract of the United States, 1995 (Washington, D.C.: US Government Printing Office, September 1995).¹¹⁸

^bSensitivity analysis for Gulliver's Travels.

^cSensitivity analysis for Digital Cacophony.

^dNotional rate.¹¹⁹

^eIn 1992 the largest MNC in the world, and the world's 23d largest economic unit. Papp, 95.

^fInformation Please Almanac, Atlas and Yearbook, 1996, 49th Edition (New York: Houghton Mifflin Co., 1996).¹²⁰

^gGary Hoover et al., Hoover's Handbook of American Business (Austin Tx.: The Reference Press, 1995).

^hA 50 percent annual growth rate was assumed to be unsustainable.¹²¹

Table 5
2025 Per Capita GDP in Billions

Country	1994*	2025 Est.
US	25,850	37,740
China	2,500	26,730
India	1,360	3,424
Pakistan	1,930	5,450
Russia	4,820	8,355
Japan	20,200	54,597
Germany	16,580	39,315
Mexico	7,900	7,992
Iran	4,720	5,114
Turkey	4,910	13,825
Saudi Arabia	9,510	3,865
S. Africa	4,420	2,559
Brazil	5,580	7,664
Italy	17,180	29,663

*The World Factbook (Washington, D.C.: Central Intelligence Agency, Office of Public and Agency Information, 1995).

As the study participants examined the impact of the drivers on the alternate futures, two worlds emerged as clearly outside the boundaries of existing trends. Economic growth rates in the alternative futures were based on a relative scale. Consequently, in *Digital Cacophony* the growth rates were greater than current trends, while in *Gulliver's Travails* the rates were lower than current trends (table 4). Thus, a range of projected economic data points was created. The world of *King Khan* contains two further extremes that lie outside table 4. In *King Khan*, the GDP of greater China is estimated at \$75.6 trillion. The GDP for the United States in that world was estimated using a notional 1.3 percent average annual growth rate, yielding a 2025 GDP of \$10.1 trillion.¹²²

Some facets of existing trends merit special mention. For instance, the current rate of growth in the Chinese GDP

indicates their economy will supplant that of the United States as the world's largest economy by 2001. Furthermore, combining Western Europe's 1996 GDPs with those from Central and Eastern Europe would create a market encompassing 850 million peoples and a combined GDP of \$12-14 trillion, already dwarfing the current American GDP of around \$7 trillion.¹²³ Table 4 demonstrates that extrapolating growth rates to 2025 describes a world in which the GDP of China is four times that of the United States, though table 5 shows that the per capita GDP of the United States is still 40 percent greater than that of China while both trail Japan.

Trends in the growth of MNCs also require notice. Most opinions indicate that MNCs will continue to grow in size, economically if not in personnel, and new ones will appear.¹²⁴ This has critical bearing on the power of the nation-state, since in 1992 the world's 44 largest MNCs were among the 100 largest economic units and produced almost 10 percent of the world's gross product.¹²⁵ MNCs will grow not only in size but in power, particularly as governments downsize by privatizing certain aspects of social programs.¹²⁶ To gather a further sense of the sprawling size and economic clout of MNCs, consider that one-quarter of all world trade is currently between subsidiaries of the same firm.¹²⁷ If this trend continues, it will proportionally diminish the relative power of states, an effect that is exacerbated as state control of currency rates diminishes.¹²⁸ The calculations for the MNCs also demonstrate the danger of extending growth rates for corporations indefinitely into the future. If one accepted the calculations wholeheartedly, then Genentech would develop into the world's second largest economic unit in *Digital Cacophony*, and Intel would be the fifth largest economic unit in the same world.

Notes

1. Will Kopp, *Vital Speeches of the Day*, vol. 60, no. 8, 244. Address delivered at Perry/Morgan County National Honor Society Recognition Conference, Zanesville, Ohio, 22 November 1993.

2. In 1991 Marvin Cetron and Owen Davies identified 50 trends that would shape the world in the 1990s. They grouped these 50 trends into 12 different fields: population, food, energy, environment, science and technology,

communications, labor, industry, education and training, world economy, warfare, and international alignments. Marvin Cetron and Owen Davies, *50 Trends Shaping the World* (Bethesda, Md.: World Future Society, 1991). Cetron revised his forecast in 1994, identifying 74 trends that would shape America in the year 2000, this time aligned in seven different areas: general long-term societal, technology, educational, labor force and work, management, values and concerns, family, and institutional. Marvin Cetron, *74 Trends that will Affect America's Future—and Yours* (Bethesda, Md.: World Future Society, 1994). Examining only into the field of science and technology, *Industry Week* identified six technologies for 2020 that the authors assert will be virtually indistinguishable from magic: nanotechnology, smart systems, biotechnology and medical advances, bioelectronics, information and communications, and thinking computers. Tim Stevens, "Do You Believe in Magic," *Industry Week*, 21 August 1995, 72. Will Kopp divided his technology categories into health care, the environment, transportation, and commercial and industrial technology. For an entire text discussing the future, see John L. Petersen's *The Road to 2015* (Corte Madera, Calif.: Waite Group Press, 1994). Petersen broke his categories into technology, the environment, exploding population growth, shifts in energy, new directions in transportation, space, health, changing social values, economies, political relationships, and wild cards.

3. It is useful to caution that though a particular field now seems to have unlimited potential, "it seldom is possible to predict the full technological, economic, and social impact of inventions, even long after their commercial introduction." The source of that quote continues by examining the checkered history of lasers, computers, railroads, the telephone, and other accepted technological marvels. For example, the laser was invented at Bell Laboratories, yet lawyers were initially reluctant to seek a patent for the laser on the grounds it had no relevance to telephone systems. Similar stories apply to numerous advances. Nathan Rosenberg, "Trying to Predict the Impact of Tomorrow's Inventions," *USA Today*, May 1995, 85–87. On the negative side of the equation, some technologies are estimated to have unlimited opportunities for growth in the near term, and fail. For instance, jetpacks were designed during the 1960s, but the amount of fuel required to fly any distance rapidly outgrew the capability of an individual to carry the fuel supply. In the field of semiconductors many believed that silicon would be replaced by now as the substrate of choice, but the extant research and development base associated with silicon has allowed it to retain a commercial advantage over competing technologies such as gallium arsenide. John Rennie, "The Uncertainties of Technological Innovation," *Scientific American*, September 1995, 5743–5744.

4. David A. Patterson, "Microprocessors in 2020," *Scientific American*, September 1995, 49.

5. George I. Zysman, "Wireless Networks," *Scientific American*, September 1995, 53.

6. Zysman, 51. Since 1980, the "power of computers per unit cost is increasing at the rate of 4,000 times per decade." That means a computer purchased in 1995 is 4,000 times more powerful than a similarly priced computer in 1985. Petersen, 30.

7. Pipelining is achieved by designing the low-level commands of the hardware to increase performance. In a simple analogy, a single individual can wash a load of clothes, then dry them, then fold them, then repeat that sequence until all the clothes are washed, dried, and folded. A more efficient method is to put a load of clothes in the washing machine once the previous load is moved to the dryer, and fold the clothes that are now dry. The next step after pipelining is superscalar, which uses the same idea, but handles larger loads. Finally, in parallel processing all loads are washed simultaneously in separate machines, then dried separately, then folded separately if enough people are available to fold the clothes. Patterson, 49. "There are many ways in which parallelism can be built into a computer. The simplest, perhaps, is the processing of bits of data words simultaneously in arithmetic or logical operations, rather than serially." Frederick J. Hill and Gerald R. Peterson, *Digital Systems: Hardware Organization and Design* (New York: John Wiley and Sons, 1978), 329. For an example of massive parallelism consider the human, who can talk, walk, and process external and internal inputs simultaneously.

8. Ibid., 50; and "Through the Glass Lightly," *Science* 267 (17 March 1995): 1612. Other technologies that may provide factors of speed from a hundred to a trillion times faster than current technology include quantum dots, quantum computers, holographic association, optical computers, or DNA computers. For a brief discussion of these technologies the following article is salient. "Computer Scientists Rethink Their Disciplines Foundations," *Science* 269 (8 September 1995): 1363-1364.

9. Kopp.

10. Various authors suggest that large members of the middle class will find themselves out of jobs. Alvin Toffler and Heidi Toffler, "Getting Set for the Coming Millenium," *The Futurist*, March-April 1995, 12. Some go so far as to suggest that no new employment sectors may arise to replace those jobs that disappeared. Also Art Levine, "The Future is Bleak," *Esquire*, October 1993, 153.

11. Philip E. Ross, "Software as Career Threat," *Forbes*, 22 May 1995, 240. Even toy cars are using computers: some "1995 model cars contain over 50 microprocessors." Nicholas Negroponte, *Being Digital* (New York: Vintage Books, 1995). The full-scale Toyota Camry reportedly has 64 microprocessors. That says as much about the capabilities now embedded in toys as it does about the reliance of modern autos on computer technologies. Petersen, 31.

12. Since 1961 more than 500,000 industrial robots have been placed in service. "They are common sights in chemical processing plants, automobile assembly lines and electronics manufacturing facilities, replacing human labor

in repetitive and possibly dangerous operations." Joseph F. Engelberger "Robotics in the 21st Century," *Scientific American*, September 1995, 132.

13. Ross, 246.

14. Viruses can attack databases, hard disks, computer chips, monitors, or software programs themselves. Winn Schwartau, *Information Warfare* (New York: Thunder's Mouth Press, 1994), 104.

15. Ross, 240.

16. Parsons Technology, *Personal Tax Edge*, Hiawatha, Iowa. Other popular tax programs include Block Financial's *Kiplinger TaxCut* and Intuit's *TurboTax*. Anne Willette, "Tax software acts as drawing card," *USA Today*, 16 February 1996.

17. *Family Lawyer* documents are state-specific and "valid in 49 states and the District of Columbia. (Some may not be valid in Louisiana.)" Parsons Technology, *Family Lawyer*TM (formerly *It's Legal*[®]).

18. Ross, 240.

19. Kasparov said that with Deep Blue, quantity had become quality. By looking multiple moves into the future, Deep Blue achieved effects similar to those achieved intuitively by human beings. Charles Krauthammer, *Time*, 21 February 1996, 60-61.

20. How available are strong chess programs? One of the authors, Kevin Smith, is rated among the top 12 percent of all human players in the world, yet computer packages are available for less than \$100 that are capable of defeating him handily, by his own account. A decade ago, the best packages were incapable of providing a challenge except when using very fast time controls; e.g., allotting each side only one or two minutes for an entire game.

21. To simplify the computer's workload, a database of opening moves, or book, is usually part of the computer. The computer's ability to look at multiple plys (a ply is one move, by one side) can actually operate against it during the opening because a computer tends to make judgments based on an algorithm it applies equally to all parts of the game after exiting the book. But during the opening, the potential range of moves is so high that extensive calculations are generally counterproductive. Instead, as a general principle, it is more important to develop pieces, particularly minor pieces, and operate to control the central squares of the board. By exiting quickly from standard opening lines a player can create a mismatch between general principles and the computer's algorithms. This mismatch will often result in the computer making moves inappropriate to the opening phase of a chess game, potentially granting the human player a decisive edge. Lev Alburt and Larry Parr, "Beating the Beasts, Part I," *Chess Life*, April 1996, 18-19. Comments on general principles in the opening. Kevin C. Smith, United States Chess Federation Life Member, over-the-board rating 1848, Class A.

22. Alvin Toffler and Heidi Toffler, *War and Anti-War* (New York: Warner Books, 1993), 177.

23. Another problem with computer viruses is the expenditure of resources to combat their effects. Schwartau estimates that the American government and industries have spent billions combating viral infections. Schwartau, 102, 109.

24. Petersen, 205.

25. Toffler and Toffler, *War and Anti-War*, 158.

26. Though satellites themselves are relatively nonmaneuverable, the power of directed-energy weapons could be concentrated through the placement of affordable reflector satellites positioned in appropriate constellations. "Aerospace Power Capabilities," Air Force Manual 1-1, vol. II (Washington, D.C.: Department of the Air Force, March 1992), 82. "Due to the energy requirements, satellites normally are not very maneuverable relative to their orbital paths." Although these reflector satellites are much simpler than a complete laser satellite, "they still must be precisely positioned and be capable of very accurate pointing/tracking tasks associated with the beam relay process." Col Gerald Hasen et al., electronic message, **2025** technology team, Air Force Institute of Technology, Wright-Patterson AFB, Ohio, 9 April 1996.

27. Kopp.

28. Petersen, 204.

29. Institute for National Strategic Studies, *Strategic Assessment 1995* (Washington, D.C.: National Defense University, 1995), 155.

30. Petersen, 197.

31. Bandwidth can be thought of as the amount of information that can be transmitted in a given period. In communications, bandwidth is often measured in bits per second.

32. This is fundamental and is almost certain not to change by **2025**. *New World Vistas* does not say there will be unlimited bandwidth; the information technology volume "predicts an effectively infinite data-rate for the communications backbone, but *bandwidth-constrained backbone-to-platform transfers*. Therefore one must specify what is most important in a given situation and not build systems and CONOPS that require an unlimited amount of bandwidth and security." USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century* (unpublished draft, the information technology volume, 15 December 1995), 14 and Hasen et al.

33. Adm William A. Owens, "A Report on the JROC and the Revolution in Military Affairs," in Maj Glenn Cobb, ed., *Theater Air Campaign Studies* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 210-214.

34. A terabit equals 10^{12} bits, or one trillion bits.

35. "Through the Glass Lightly," 1613. In theory, a single fiber could carry 25 terabits per second. However, current technical issues make it difficult for electronic equipment to handle transmission speeds above 50 gigabits per second. Vincent W. S. Chan, "All-Optical Networks," *Scientific American*, September 1995, 56-59.

36. Stevens, 72.

37. George J. Stein, "Information War-Cyberwar-Netwar," *Battlefield of the Future* (Maxwell AFB, Ala.: Air University Press, 1995), 153-170.

38. Col Phillip S. Meilinger, *10 Propositions Regarding Air Power* (Maxwell AFB, Ala.: School of Advanced Airpower Studies, 1995), 47.

39. Frederick H. Hartmann and Robert L. Wendzel *America's Foreign Policy in a Changing World* (New York: Harper Collins College Publishers, 1994), 184.

40. Henry Kissinger, *Diplomacy* (New York: Simon and Schuster, 1994), 671. According to David Halberstam, in his book *The Powers That Be*, this event caused Johnson to tell his press secretary, "If he had lost Walter, he had lost Mr. Average Citizen." Lt Col Marc D. Felman, "The Military-Media Clash and the New Principle of War: Media Spin," *Theater Air Campaign Studies* (Maxwell AFB, Ala.: Air Command and Staff College, 1995), 9.

41. Felman, 186.

42. Toffler and Toffler, *War and Anti-War*, 203.

43. *Ibid.*, 199.

44. A 30-watt radio transmitter has an extremely limited range. For purposes of comparison, a 30 kW transmitter has an approximate range of 40 miles. The import of the 30-watt transmitter lies in the notion that individuals are empowered to spread their message via means that are difficult for the sovereign power of the state to control. The Internet similarly erodes government power, as Singapore is discovering in their attempts to police the net. Brit Hume and T. R. Reid, "Citizens go online for information restricted by their governments: Leaders can't police Internet," *The Atlanta Journal/The Atlanta Constitution*, 14 April 1996.

45. Kenneth B. Noble, "Defying Airwave Rules and Exporting the Way," *The New York Times*, 24 January 1996, A7. It has been asserted that commercial capabilities such as Direct Broadcast Satellite are a threat to the sovereignty of nations that had maintained a communications monopoly. Institute for National Strategic Studies, *Strategic Assessment 1995* (Washington, D.C.: National Defense University, 1995), 159.

46. One article described this media revolution in the following way: "The information and communications picture of the future is dominated by a ubiquitous, worldwide decentralized network of interconnected webs, evolving as a technological organism." Stevens, 72. Another article discusses the impact the media and information revolution are already having on politics and the major media sources, as individuals significantly impact events that might once have disappeared under the onslaught of news that journalists instead chose to present. John Fund's thesis is that alternative sources of information can impact the direction of policy and legislation by empowering groups in ways that discomfit both the established major media sources and the politicians who must adapt to new methods. As an example of the power of information, he cites Scott Shane's *Dismantling Utopia*, asserting that "technology and the information it conveys directly contributed to the collapse of the Soviet Union." John Fund, "There is No Stopping the Information Revolution," *USA Today*, May 1995, 88-90.

47. Felman, 85.
48. Quote from Arlen Andrews, Sandia National Laboratory, in Stevens, 69.
49. Japanese interest in these technologies is exemplified by the \$200 million they are spending on research. Art Levine, "The Future is Bright," *Esquire*, October 1993, 152.
50. *Ibid.*, 69.
51. Stevens, 69.
52. *Ibid.*, 70.
53. Neal Stephenson, *The Diamond Age* (New York: Bantam Books, 1995).
54. Stevens, 71. The first example of gene therapy was conducted on 14 September 1990, to treat a case of severe combined immunodeficiency (SCID). The patient now receives occasional follow-up treatments, but is no longer quarantined. W. French Anderson, "Gene Therapy," *Scientific American*, September 1995, 96-98B.
55. "Through the Glass Lightly," 1609.
56. Cetron, 5; and Kopp.
57. Scripps Howard News, "Medical researchers foresee rosy future," *Montgomery Advertiser*, 11 February 1996, A10.
58. William Hoagland, "Solar Energy," *Scientific American*, September 1995, 136-139.
59. Current oil reserves, about 1 trillion barrels of proven and probable reserves, are sufficient to meet the assumed demands well into the twenty-first century. Petersen, 145.
60. Hoagland, 137.
61. Cetron, 9.
62. Hoagland, 136-139.
63. Petersen, 153.
64. *Ibid.*, 154.
65. Hoagland, 136-139.
66. Toffler and Toffler, *War and Anti-War*, 288.
67. *Ibid.*, 289.
68. *Ibid.*, 291.
69. Linear extrapolation performed on 1945-1993 data taken from Papp indicates that the number of countries in **2025** will equal 250. Note that *Gulliver's Travels* is only 19 percent greater (297), according a relatively high degree of plausibility to that world. Daniel S. Papp, *Contemporary International Relations* (New York: Macmillan College Publishing Co., 1994), 42. According to the *World Factbook* there are 184 UN members; seven nations that are not members of the UN (Holy See, Kiribati, Nauru, Serbia and Montenegro, Switzerland, Tonga, Tuvalu); Taiwan; 63 dependent areas under the jurisdiction of nine countries; and six miscellaneous entities (Antarctica, Gaza Strip, Paracel Islands, Spratly Islands, West Bank, Western Sahara) for a total of 261 entities. *The World Factbook 1995*

(Washington, D.C.: Central Intelligence Agency, Office of Public and Agency Information, 1995), ix.

70. Schwartau, 39.

71. Cetron and Davies, 1. Schwartau suggests that economic warfare will become the medium of choice for inflicting damage on other global powers. At least part of the reason is that the US has already demonstrated a capability to counter "gun-toting armies." Schwartau, 43.

72. Cetron and Davies, 7. Schwartau suggests that the growth in global communications will allow the have-nots to fully glimpse how well the haves live. This will spur immigration, whether legal or illegal, creating a growing source of potential conflict since the population of the undeveloped nations is growing faster than that of the advanced technological societies. Schwartau, 36.

73. Toffler and Toffler, *War and Anti-War*, 251.

74. *Strategic Assessment 1995*, 183.

75. Michael D. Lemonick, "Heading for Apocalypse?" *Science*, 2 October 1995, 54-55.

76. Cheryl S. Silver and Ruthe S. DeFries, *One Earth, One Future: Our Changing Global Environment* (Washington, D.C.: National Academy Press, 1990), 174-175.

77. Lemonick, 5.

78. F. Peter W. Jennings, *Energy Use and the Environment* (London: Lewis Publishers, 1991), 44.

79. Les Line, "Acid Rain Leading to Moose Deaths," *The New York Times*, 12 March 1996, B6.

80. Papp, 556.

81. *The World Factbook 1995*, 526.

82. Papp, 556.

83. "Asian Survey," *The Economist*, 30 October 1993, 14.

84. Cassius Johnson, "From Carbon to Diplomacy: A Sketch of the Interrelations Among Energy, Electric Power, the Economy, the Environment, Global Warming, and Foreign Policy in China, 1995-2025" (Maxwell AFB, Ala.: Air War College Regional Studies Paper, 21 February 1996), 5-7.

85. Unilateral corrective actions can create a national handicap, particularly for developing nations. Jessica Poppela, "The CFC Challenge," *The China Business Review*, July-August 94, 34-38.

86. "The Treaty that Worked—Almost," *Scientific American*, September 1995, 16-18.

87. Piquantly, some industrialized nations, such as those in North America and Western Europe, are experiencing certain levels of reforestation. This reforestation is sustained by "green" movements and the return to nature of lower-yielding croplands. Such results are unlikely to be replicated in areas such as the Amazon Basin and China. Erosion and depredation of the soil's nutrients are generating conditions that cannot support new growth. Silver, 116-121.

88. *Ibid.*, 174-175.

89. Ibid., 124.
90. Explosive population growth has altered traditional cultivation patterns, resulting in accelerated deforestation and subsequent species depletion. Ibid., 118–119.
91. Ibid., 121.
92. Ibid., 118–122.
93. A “CO₂ sink” conceptually describes the fact that forests, and plant life generally, remove CO₂ from the atmosphere.
94. Silver, 63–67.
95. If much of the global warming can be traced to human atmospheric pollutants, then China’s share of the burden is increasing rapidly as they industrialize. As of 1993 China emitted 11 percent of the world’s CO₂. By 2020, China is projected to be the leading emitter, with over 20 percent of the world’s emissions. Vaclav Smil, *China’s Environmental Crisis* (Armonk, N.Y.: M.E. Sharpe, 1993).
96. Environmental warming also occurs at the regional level, even down to metropolitan areas. Since the 1970s Atlanta has experienced an average temperature increase of six to nine degrees. The primary cause is the removal of trees and the subsequent building of concrete and paved structures. As heat rises, it is more likely that smog and other pollutants will form. As a result of these factors, a low pressure area is created over the city center that traps the hot air and pollution, generating a self-sustaining “heat island.” Studies indicate that Atlanta could save \$4.6 million annually in cooling by planting trees in selected areas. Charles Seabrook, “Hotlanta gets hotter as trees fall to development,” *The Atlanta Constitution*, 27 March 1996.
97. It should be noted that aerosols, chemicals like sulfur dioxide that are produced when fossil fuels are burned, have a cooling effect, but not enough to counterbalance the impact of carbon dioxide. Carl Zimmer, “Verdict (almost) in,” *Discover*, January 1996, 78; Papp, 556.
98. Lemonick, 54–55.
99. Half of Bangladesh is less than five meters in elevation, and storm surges currently travel as far as 200 km inland. In Egypt the populace lives on only 3.5 percent of the land. If the sea level rose 13 to 133 cm as much as 19 percent of the inhabitable land could be inundated. Silver, 97–101.
100. Cost estimates to protect the nation’s recreational barrier islands range “from \$135 billion to \$200 billion for a 2-meter rise.” Silver, 101.
101. Toffler and Toffler, *War and Anti-War*, 172.
102. Cetron and Davies, 7.
103. Educational programs are already extant for the very young, children from the ages of two to five. Programs teach math, the ABCs, reading, and innumerable other topics. This bloc of children educated on computers will provide the basis for a group used to learning electronically. The article cited provides a list of freeware, indicating that education has already evaded the grasp of traditional classrooms, unrestrained by any cost other than the initial purchase of the computer itself. Noah Matthews, “Some

programs are designed for the very young," *The Atlanta Journal/Constitution*, 24 March 1996.

104. Marvin, 5.

105. "Through the Glass Lightly," 1615.

106. An alternative school currently exists in Framingham, Massachusetts, that allows students to establish their own self-directed educational agendas. Similar schools have been developed in 11 other states. John Larrabee, "Private alternative school thrives without structure," *USA Today*, 7 February 1996.

107. Dr Allen L. Hammond et al., *World Resources 1994-95* (New York: The World Resources Institute, 1994), 32.

108. Marshall T. Savage, "Dawn of a New Millennium," *Ad Astra*, July/August 1995, 41; and Papp, 519. For a succinct compendium of articles regarding limits to growth, population control, and migrations, see Paul Neurath, *From Malthus to the Club of Rome and Back* (Armonk, N.Y.: M. E. Sharpe, 1994).

109. "In population projections, an important variable is the time at which a country's fertility rate drops to the replacement level of two children per woman." Hammond, 30.

110. Knight-Ridder Tribune, "Scientists: Too many resources consumed," *The Sunday Montgomery Advertiser*, 11 February 1996. Kopp notes that clean water may cost \$20 per barrel by 2025; and Kopp. At such a price, the value of water would be comparable to the price of oil in 1996. Considering that US national security strategy declares access to the oil of the Persian Gulf to be an American vital interest, it is apparent that \$20 barrels of water would merit equal consideration from other parties around the world. This ties in neatly with a mention by the Institute for National Strategic Studies that water disputes might arise over the Euphrates River involving Turkey, Syria, Iraq, or Iran. *Strategic Assessment 1995*, 183.

111. Papp, 516.

112. *Ibid.*, 516-518.

113. A 1994 estimate places the total world population at eight billion in the year 2021, and only nine billion in the year 2035, not reaching the 10 billion estimate of the table until the year 2054. Source: Population Division, Department for Economic and Social Information and Policy Analysis, *World Population Growth from Year 0 to Stabilization* (New York: United Nations, mimeograph, 7 June 1994). Wolfgang Lutz, director of the International Institute for Applied Systems in Vienna, Austria, expects the world population to stabilize around 10 billion by 2025 and below 12 billion by 2100. Knight-Ridder Tribune, "Scientists: Too many resources consumed."

114. Cetron and Davies, 2.

115. Life expectancy has increased due to the widespread advances in nutritional standards, health care services, and medical science. In poor countries, however, fertility rates did not fall to correspond to this new demographic dynamic. Thus the steep rate of growth in figure B-5. What this curve does not depict is the corresponding change in the relative

proportions of the young and old. By 2020, estimates suggest that those over 60 years of age will comprise over 10 percent of the total, up from nine percent in 1995. At the same time the percentage of those under the age of 15 will decline from 46 percent to 26 percent as birth rates decline. This accounts for the flattening of the population growth curve following 1995. Winteringham, 95. One prediction foresees a breakthrough by 2005 providing 115 to 120 years of good health for the average human. Cetron, 10.

116. Calculations based on data in *Statistical Yearbook, Thirty-Ninth Issue*, Department for Economic and Social Information and Policy Analysis, Statistical Division, United Nations, New York, 1992; and *Statistical Abstract of the United States 1995* (Washington, D.C.: US Government Printing Office, 1995).

117. Cetron and Davies, 2.

118. Note that *The World Factbook 1995* GDP figures, in billions, are based on a one-year sample. As a result the change in GDP does not reflect long-term trends. In fact, in 1994 the GDPs for several of the countries shown actually suffered an annual decline: Russia, -15 percent; Iran, -2 percent; Turkey, -5 percent; Saudi Arabia, -3 percent. Furthermore, the actual rate of growth for the Japanese economy in 1994 was 0.6 percent, well below historical norms, while the US rate of 4.1 percent was above historical norms. Therefore, historical growth rates were calculated over the period 1985-1993.

119. Since Russia did not exist in 1985 as a separate economic entity, it was not possible to derive a long-term growth rate based on the period 1985-1993, as was done with the other growth rates. Therefore, a notional rate of 2 percent growth was assigned to the projected Russian growth rate, slightly less than industrialized nations such as the US and Germany and about the same as Italy.

120. Revenues for General Motors in 1994 in millions of dollars. This serves as a measure of how large multinational corporations are relative to national economies.

121. This case illustrates the fallacy involved in extending a corporation's growth rate over multiple decades, particularly when the corporation has not been in existence for a great deal of time. A 50 percent average annual growth rate in revenue for 30 years generates a corporation worth more than the combined wealth of all the countries in the world.

122. Peter C. Newman, "The Way to the Number One Market," *Nation's Business*, 1 October 1994, 56.

123. Schwartz, 39.

124. Cetron and Davies, 7. Cetron suggests that by 2010 there will be only five major automakers in the world, and only three computer hardware firms. Paradoxically, microbusiness will also flourish, as entrepreneurs seek to support ever narrower niche markets. Cetron, 11. One of the **2025** senior advisors suggested that MNCs would actually diminish in significance in the future. He felt they would be displaced by a series of niche competitors who exceeded the ability of the MNCs to respond to specialized customer demands.

The Alternate Futures team included the idea of niche competitors in several worlds, but chose not to disregard the survival potential of MNCs over the relatively short time frame of three decades.

125. "Perhaps even more surprisingly, every one of the world's largest Fortune 500 corporations in 1991 produced more than the world's 61 smallest state economies." Papp, 94.

126. Cetron and Davies, 9.

127. Toffler and Toffler, *War and Anti-War*, 290.

128. *Ibid.*, 288.

Appendix C

Matrix of Additional Characteristics

World Name →	<i>Gulliver's Travels</i>	<i>Zaiabatsu</i>	<i>Digital Cacophony</i>	<i>King Khan</i>	<i>Halfs and Half-Naughts</i>	<i>2015 Crossroads</i>
Worldview	Global	Domestic	Global	Domestic	Trending towards Global	Global with pressure to turn Domestic
Δ TeK	Constrained	Exponential ⁿ	Exponential ⁿ	Constrained	half and half	Constrained
Global Power Grid	Dispersed	Concentrated	Dispersed	Concentrated	Concentrated drifting to Dispersed	Concentrated with trend towards Dispersed
World Slogan	Our Brother's Keeper	Veni, Vide, VISA	10101010101110011010100	The East is the Best	Survival of the richest	Might makes right
Environment	Green world-a nice place to live-resources are strained but OK	"Gray" world-business does what it wants-areas polluted	256 color world-Δ TeK causes some, but solves 1996 environ. problems	Brown world-polluted by 2d wave industry	Mottled-green and brown	Global warming, CFC smuggling
Resources	Consumption of scarce resources are regulated	Sufficient water & food but must pay for the best	Information, bio Tek yields record crops-despite new viruses	Water is scarce-quality poor. Strip mining acceptable	#1 Info, #2 Oil (alt forms 1) #3 Water	Military hardware (G-3 export next threat)

World Name →	Gulliver's Travails	Zaibatsu	Digital Cacophony	King Khan	Hafts and Half-Naughts	2015 Crossroads
Technology	Technology grows at evolutionary rate. Info superhighway is jammed and overloaded-all information is taxed. Δ Tek is constrained by environmental concerns-electric car subsidy.	Very high Δ Tek world-top down driven; Zaibatsu promotes mass transit, industrial and info centers. Highly efficient Δ Tek R&D funded by MNCs.	Highest Δ Tek world-Δ Tek is uncontrollable/ unpredictable. Breakthrough technologies spur other scientific firsts. "Information is everything." Individuals have high leverage.	Lowest Δ Tek world. Parity exists among most nations. Industrialized world-increase in combustion engines-Ground Effect Vehicles (GEV).	Explosive info tech, robotics, communications, biomedical-evolutionary in other areas	Evolutionary in all areas. No new sources of energy.
Politics and Diplomacy	Strong domestic support for US leadership-consensus building and alliances are important-number of nation-states continue to increase	Company Congress-Zaibatsu and Gvmt work together-power of nation-state is reduced. UN has small army.	US engaged in the world-WMD technology is available to all who want it. Nation-states are on the decline due to electronic democracy.	Gvmt tries to meet people's social needs. Internal problems a priority. US needs trade with Khan for recovery.	Security Council hub of conflict resolution-not always successful. Foreign aid important.	Tripolar world (G-3). EU digesting E Eur. Minimize Russian and China expansion.
US Budget	Slow growth in military budget-constrained modernization.	Economy is powerful, but military gets a small portion \$.	Globally connected high-octane economy-biggest DOD budget	Financially challenged-coming out of depression	Moderate growth (3.5%)-DOD is 2% of GDP	Modest growth, DOD budget constrained.

World Name →	<i>Gulliver's Travels</i>	<i>Zalbatsu</i>	<i>Digital Cacophony</i>	<i>King Khan</i>	<i>Halfs and Half-Naughts</i>	<i>2015 Crossroads</i>
Education	Federally funded for the basics- # of bilingual schools increase	Government provides bare minimum, education costs higher	Access for the masses-Harvard at Home-smart pills-number of PhDs increase	Various lower sources of education. Irregular attendance	Privatized (on-line and private schools to increase quality for all), info-niche trade schools	Back to basics. Retirees create boom in graduate education.
Military	Multiple national actors and numerous confrontations	Bottom line: war is not as profitable as business	WMDs drive our interest and funding of the military	Severely diminished due to budget cuts- no global reach and no global power	Do everything with less. Info highly leveraged.	US forces from 1996-2001, contain Russia and China expansion.
Energy	Alternate forms— but expensive	Nuclear fusion	Numerous sources- no problem, fusion	Fossil fuel primary source	Efficient use. Fossil (evolving to other forms)	Fossil fuels still dominant, no breakthroughs in alternate energy.
Ethnicity/ religion	Ethnic nationalism is high	Highly co-opted	Increased individualism	US cultural tensions increase	Brahmins vs. untouchables (class differences dominate)	Transborder nationalism. (exportation of ideology & ethnic nationalism)

World Name →	Gulliver's Travails	Zaibatsu	Digital Cacophony	King Khan	Haifs and Half-Naughts	2015 Crossroads
Actors	Terrorists, alliances, nations, US	MNCs, UN, Interpol	Potentially millions- chaos	No peer to the "Great Khan"	States (Big 4), Security Council, MNCs, org. crime	#1 G-3, #2) EU, #3) Japan, Iran, OPEC
Trade	Multiple actors using multiple currencies to trade with multiple partners. Near chaos.	Zaibatsu chief facilitator	Internet-"cybertrade"	High bulk trade- food/machines	Mostly electronic-less bulk. More interdependence especially among Big 4.	G-3 arms cartel
International Law	Torts and environmental laws	Corporate contractual law	Intellectual property/privacy	Strong criminal law	Intellectual property rights are big source of conflict.	G-3
Social Services	Social services at capacity	Increased privatization	Customer tailored systems	Tears in gvmt safety net	Workfare replaces welfare.	US: oriented towards retirees, family restructuring
Orientation/ Age	Inner directed/life exp. 78 yrs	Outer directed/ life exp. 86 yrs	Inner directed/ life exp. 97 yrs	Survival/life exp. is 67 yrs	Thriving surviving, and dying/81	Inner & outer (volunteerism)/76

World Name →	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Cacophony</i>	<i>King Khan</i>	<i>Halfs and Half-Naughts</i>	<i>2015 Crossroads</i>
Sports/ Recreation	Football, soccer, baseball	Golf, tennis, squash, racquetball	Sensurround systems	Street games- organized sports not as important	Video games, Olympics, World Cup	Adventure vacations
Health Care	National system	Contracted to MNCs	Dial-a-net doctor	Left to individual-home doctors	Triage (contagious diseases targeted)	Rationed

Appendix D

Systems, Concepts, and Technologies

Tables 6 through 10 contain notional systems, concepts, and technologies that could be especially useful in each of the six alternate futures. These systems, concepts, and technologies provide a sense of what the nature of air, space, land, and sea power is like in each world. The tables contain information on general military forces (table 6), space power (table 7), airpower (table 8), land power (table 9), and sea power (table 10).

Table 6
General Military Forces

System/Concept/ Technology	Gulliver's Travels	Zalbatsu	Digital Caco- phony	King Khan	Halfs & Half- Naughts	2015 Cross- roads
In-Time Information Integration System (I²S): Intelligent micro-processor using artificial intelligence, neural nets, & fuzzy logic. Provides just the right information to the decision maker. Combines all forms of intelligence collection. ^a	X	X	X		X	
Virtual Planning and Execution Resource System (VIPERS): Son of Global Command and Control System. Follow-on WWMCCS. ^b	X	X	X	X	X	X
Supercooled plasma "memories": Provides multiple terabytes in one mm ² size storage units. ^c		X	X			
Image Understanding Software: Pattern recognition for target ID and image intelligence. ^d		X	X			

Table 6 (cont'd)
General Military Forces

System/Concept/ Technology	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Weather Command Center (WCC): A system to support the war-fighting CINCs with weather prediction, and modification. ^e	X	X	X	X	X	X
Miniature satellite communications units: Communications system constructed of micro-mechanical devices where a "single chip" is the entire system. Embedded into helmet, clothing, or wristband. Controlled by voice, gesture, or thought. ^f	X	X	X	X	X	X
Language Translator: Unobtrusive "hearing aid" or hand-held translator to interpret different languages. Two-way capability (receive in one language, interpret-transmits in selected language). ^g	X	X	X	X	X	X
Microchip Purchases: Microchips embedded in equipment initiate request for replacement at appropriate time. Request is transmitted to satellite then relayed to distribution center. ^h	X	X	X	X	X	X
Battlefield Delivery System (BDS): Permits the seamless flow of containerized materiel from embarkation to forward area. Uses automated identification technologies (AIT) and radio frequency identification (RFI). ⁱ	X	X	X		X	X

Table 6 (cont'd)
General Military Forces

System/Concept/ Technology	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Delphi: Database of databases. Combines relevant databases using artificial intelligence to create "knowledge" of potential adversaries ^l	X		X		X	
Fuzzy Cognitive Map (FCM): Software to shorten cycle time of OODA loop. Intelligent system learns from data or by watching behavior of human experts. ^k	X	X	X	X	X	X
Target Acquisition: Active and passive interrogation system will use a multitude of sensors (magnetic, optical, electronic, acoustic, infrared, etc.) to label "friendlies." ^l	X	X	X	X	X	X

^aCol Robert L. Atkins, Jr., et al., "Surveillance and Reconnaissance Real-Time Integration" (2d draft of white paper for **2025** Study), 11-12.

^bLt Col Gregory J. Miller et al., "Combat Support" (2d draft of white paper for **2025** Study), 7.

^cIbid., 10.

^dIbid., 15.

^eLt Col William B. Shields et al., "Weather Modification" (2d draft of white paper for **2025** Study), 15-16.

^fCol James A. Cerniglia et al., "Special Operations" (2d draft of white paper for **2025** Study), 39-40.

^g**2025** Concept no. 900340, "Universal Language Translator"; **2025** Concept no. 900560, "Portable Language Translator"; **2025** Concept no. 900607, "Universal Translator"; and **2025** Concept no. 900624, "Hand-Held Translator," **2025** Concepts Database (Maxwell AFB, Ala.: Air War College/**2025**, 1996).

^hJudy L. Edgell et al., "Logistics" (2d draft of white paper for **2025** Study), 9-12.

ⁱLt Col Karen W. Currie (PhD) et al., "AFIT Logistics" (2d draft of white paper for **2025** Study), 17-22.

^jLt Col Jeffrey E. Thieret et al., "Strategic Attack" (2d draft of white paper for **2025** Study), 16-18.

^kIbid., 39.

^lIbid., 23-24.

Table 7
Space Power

System/Concept/ Technology	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Microsatellites: 20–30lb satellites using micro-electronics and alternate power sources. ^a	X	X	X		X	
Autonomous satellites: Allows continuous support even if ground control is interrupted for 180 days. Reduces support people by factor of 10. ^b	X	X	X		X	
Man in the Chair (MITCH): System semi-autonomously fuses data when collected and when processed. Wide variety of sensors on each point on the earth simultaneously. ^c	X	X	X		X	
Tactical-Aero Satellite Constellation (TASC): Constellation of vehicles operating autonomously once given mission directives. Exist in low earth orbit (LEO) until needed. Vehicles change shape to move from LEO to atmosphere then back to LEO after mission. ^d		X	X		X	
High-power Microwave: Speed of light weapon that can produce upset without damaging structures. ^e	X	X Ground-based only	X		X	X

Table 7 (cont'd)

Space Power

System/Concept/ Technology	<i>Gulliver's Travels</i>	<i>Zalbatsu</i>	<i>Digital Cacophony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
High-power Laser: Speed of light weapon that could be space-based to provide maximum coverage. ^f	X	X Ground-based only	X		X	X
Transatmospheric Vehicle (TAV): Vehicle takes off from a runway like a conventional aircraft but then is air refueled with oxidizer to achieve orbit. ^g	X	X	X		X	
Laser-based light detection and ranging (LIDAR) sensors: Detect atmospheric changes due to chemical and biological reactions. Sensors will also detect and construct 3-D images to help identify targets. ^h	X	X	X		X	
Space Support Station (SSS): Space station to replenish space vehicles with fuel, energy, personnel consumables (food, water), and facilities for rest and recreation. ⁱ		X	X			
Neutral Particle Beam (NPB): Beam of near-light-speed neutral atomic particles that deliver kinetic energy directly into the atomic and subatomic structure of a target. ^j			X			

Table 7 (cont'd)

Space Power

System/Concept/ Technology	<i>Gulliver's Travels</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Super Global Positioning System (Super GPS): Large constellation of small low earth orbit satellites capable of providing accurate position information. ^k	X	X	X		X	X
Planetary Defense: Combination of near- and far-term technologies to protect the earth from asteroids and meteors. ^l		X (Part of plausible history)			X (Part of plausible history)	

^kLt Col William W. Bradley, Jr., et al., "On-Orbit Support" (2d draft of white paper for **2025** Study), 32-34.^lIbid., 27-32.^cCDR Clarence E. Carter et al., "Space Surveillance and Reconnaissance Fusion" (2d draft of white paper for **2025** Study), 20.^dLt Col Norman K. Leonpacher et al., "Counter-Information" (2d draft of white paper for **2025** Study).^eLt Col Jamie G. G. Varni et al., "Space Operations" (2d draft of white paper for **2025** Study), 37-40.^fIbid., 27-28.^gSpacecast 2020: Operational Analysts (Maxwell AFB, Ala.: Air University, 1994), 34.^hLt Col Jeffrey E. Thieret et al., "Strategic Attack" (2d draft of white paper for **2025** Study), 27.ⁱCol Yoshio Smith et al., "Acrospace Replenishment" (2d draft of white paper for **2025** Study), 22-24.^jLt Col Jamie G. G. Varni et al., "Space Operations" (2d draft of white paper for **2025** Study), 29-32.^kIbid., 82.^lLt Col John M. Urias et al., "Planetary Defense" (2d draft of white paper for **2025** Study), 38-40.

Table 8
Airpower

System/Concept/ Technology	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Deployable Pavement Repair System (DPRS): Self-contained runway repair system easily transportable. Uses rapidly curing materials to repair concrete and asphalt runways. ^a	X				X	X
StrikeStar: Next generation of low-observable, high-altitude endurance UAV. Used for all missions. ^b	X	X	X	X	X	X
Brilliant Munitions: Uses a variety of technologies to maintain accuracy. Combines autonomous operations of smart munitions with enhanced navigation and targeting classification & identification capabilities. ^c	X	X	X	X	X	X
Morphing Automated Replenisher System (MARS): Aerospace replenishment system capable of both supersonic, as well as slow flight, using wing morphing technology in order to replenish transatmospheric vehicles as well as conventional aircraft. ^d	X	X	X		X	

Table 8 (cont'd)

Airpower

System/Concept/ Technology	<i>Gulliver's Travels</i>	<i>Zalbatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Haifs & Half- Naughts</i>	<i>2015 Cross- roads</i>
UAV Mothership: Large-wing platform using technology to create a lighter-than-air vehicle to replenish UAVs with weapons and fuel. ^e	X	X	X		X	
National Lifting Vehicle (NLV): Air- breathing lifting system—a giant flying wing using large turbofan engines. ^f	X	X	X		X	
Guided Parafail Aerial Delivery System (GPADS): Unpowered autonomous system that can deliver heavy payloads to within 30 ft of the target. ^g	X	X		X	X	
NAL Jump Jet: Hoverjet capable of both vertical and horizontal flight. Would be used as a reusable UAV to deliver payload. ^h	X	X	X	X	X	X
Mobile Base: Small, mobile, and easy to sustain and defend air base which uses quick layout runway structures which could be air dropped. Also uses nanotechnology to allow a building to set itself up and to repair itself if attacked. ⁱ	X	X	X		X	X

Table 8 (cont'd)

Airpower

System/Concept/ Technology	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Air Base Passive Defense: Combination of technologies to make a base hard to locate, and hard to attack if found, and quick to repair if attacked. Infrared signature will blend in with surrounding. Composite materials and reactive armor will be used on buildings. Nano-technology robotics will be used to diagnose damage and self-repair. Holographic images will be used to deceive. Weather control will be used to hide in overcast and fog when desired. ¹	X	X	X	X	X	X

^aCol Marvin S. Mayes et al., "Operability and Defense" (2d draft of white paper for **2025** Study), 39.

^bLt Col Bruce W. Carmichael et al., "RPV and Aerospace" (2d draft of white paper for **2025** Study), 72-74.

^cLt Col Charles B. Ottman et al., "Interdiction" (2d draft of white paper for **2025** Study), 15-16.

^dCol Yoshio Smith et al., "Aerospace Replenishment" (2d draft of white paper for **2025** Study), 16-19.

^eIbid., 19-21.

^fLt Col James A. Fellows et al., "Airlift" (2d draft of white paper for **2025** Study), 33-35.

^gIbid., 29-31.

^hIbid., 36-37.

ⁱCol Marvin S. Mayes et al., "Operability and Defense" (2d draft of white paper for **2025** Study), 40-42.

^jIbid., 36-39.

Table 9
Land Power

System/Concept/ Technology	<i>Gulliver's Travels</i>	<i>Zalbatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halts & Half- Naughts</i>	<i>2015 Cross- roads</i>
Micro-Meal Ready to Eat (Micro-MRE): Self-contained meals the size of a vitamin pill that contain all essential nutrition and calories to sustain a person 24 hrs. ^a	X	X	X	X	X	X
Underwater Prepositioned Equipment: Undersea storage of materiel currently on afloat prepositioning ships and prepositioned overseas materiel configured for unit sets (POMCUS). Reduces vulnerability to attack. ^b	X				X	X
Voice Recognition Software/Interfaces: ID/security applications and translators. ^c	X	X	X	X	X	X
Three Dimensional Holographic Display: Used in war-gaming software to create "real" battlespace. ^d		X	X			
In-Ground Effect Wings (Wingships): Hybrid sea/air vehicles capable of heavy lift over extremely long ranges taking advantage of the ground effect phenomena. Capable of lifting up to 5,000 tons. ^e	X	X	X		X	

^aJudy L. Edgell et al., "Logistics" (2d draft of white paper for **2025** Study), 24–26.

^bIbid., 30.

^cLt Col Gregory J. Miller et al., "Combat Support" (2d draft of white paper for **2025** Study), 15–16.

^dIbid., 26–27.

^eLt Col James A. Fellows et al., "Airlift" (2d draft of white paper for **2025** Study), 25–26.

Table 10
Sea Power

System/Concept/ Technology	<i>Gulliver's Travails</i>	<i>Zaibatsu</i>	<i>Digital Caco- phony</i>	<i>King Khan</i>	<i>Halfs & Half- Naughts</i>	<i>2015 Cross- roads</i>
Flying Submarine: A platform combining the capabilities of a small submarine with a vertical takeoff and landing vehicle. Would be capable of operating submerged and flying through the air. ^a	X	X	X		X	X

^aCol James A. Cerniglia et al., "Special Operations" (1st draft of white paper for **2025** Study), 52-54.

Bibliography

- A National Security Strategy of Engagement and Enlargement.* Washington, D.C.: White House, 1995.
- "A Swift, Simple Way to Engineer New Plants." *Business Week*, no. 3368 (25 April 1994): 136.
- "A Touch of Eastern Promise." *The Economist*, 26 March 1994.
- Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*, vol. 2, March 1992.
- Air University. *Spacecast 2020 into the Future: The World of 2020 and Alternative Futures.* Maxwell AFB, Ala.: Air University Press, 1994.
- Albright, David. "A Proliferation Primer." *The Bulletin of the Atomic Scientists* 49, no. 5 (June 1993): 14.
- Alburt, Lev, and Larry Parr. "Beating the Beasts, Part I." *Chess Life*, New Windsor, New York, April 1996.
- Anderson, Dr John L. "Horizon Mission Methodology." Lecture to **2025** participants, Air War College, Maxwell AFB, Ala., 23 August 1995.
- Anderson, W. French. "Gene Therapy." *Scientific American*, September 1995, 96-98B.
- Antoninus, Marcus Aurelius. *Meditations.* Chicago: Encyclopaedia Britannica, 1955.
- Ashley, Steven. "Voyage to the Bottom of the Sea." *Technology Review* 97, no. 3 (May/June 1994): 13.
- "Asian Survey." *The Economist*, 30 October 1993.
- Associated Press. "Belarussians Rethinking Move to Independence." *Montgomery Advertiser*, 31 March 1996.
- . "Russia, Belarus to Form Union." *Montgomery Advertiser*, 3 April 1996.
- Atkins, Col Robert L., Jr., et al. "Surveillance and Reconnaissance Real-Time Integration." Second draft of white paper for **2025** Study.
- "Baby Boomers Threaten Entire Pension System." *USA Today Magazine*, April 1995.
- Bacon, Sir Francis. *The Advancement of Learning*, Chapter I, V.8.
- Barnard, Bruce. "EUs Flawed East Europe Policy." *Journal of Commerce and Commercial*, 25 October 1994.

- Barnett, Jeffery R. *Future War*. Maxwell AFB, Ala.: Air University Press, 1996.
- Bishop, Dr Peter C. "Long-Term Forecasting." Lecture to **2025** participants, Air War College, Maxwell AFB, Ala., 13 September 1995.
- Bisson, T. A. *Zaibatsu Dissolution in Japan*. Berkeley, Calif.: University of California Press, 1954.
- Blackburn, Peter. "Eastern Europe frets over falling exports to EU." *Journal of Commerce and Commercial*, 23 May 1994.
- Blank, Stephen J., et al. *Conflict, Culture, and History: Regional Dimensions*. Maxwell AFB, Ala.: Air University Press, 1993.
- Blanton, Thomas, and David C. Balch. "Telemedicine." *The Futurist* 29, no. 5 (September–October 1995): 14.
- Bradley, Lt Col William W., Jr., et al. "On-Orbit Support." Second draft of white paper for **2025** Study.
- Brines, Russell. *MacArthur's Japan*. New York: J. B. Lippincott Co., 1948.
- Broad, Robin, and John Cavanaugh. "Don't Neglect the Impoverished South." *Foreign Policy*, Winter 1995–96.
- "Bulls Beware When Boomers Cash In." *Atlanta Journal/Constitution*, 24 March 1996.
- Burgess, Lisa, and Janet Porter. "Iran's arming of islands fails to upset markets." *Journal of Commerce and Commercial*, 24 May 1995.
- California Elections Internet pages at <http://ca94.election.digital.com/e/returns/prop/page.html/#prop-187>.
- Carey, John. "Science-Fiction Medicine Is Fast Becoming Fact." *Business Week*, no. 3399 (18 November 1994): 169.
- Carmichael, Lt Col Bruce W., et al. "RPV and Aerospace." Second draft of white paper for **2025** Study.
- Carter, Comdr Clarence E., et al. "Space Surveillance and Reconnaissance Fusion." Second draft of white paper for **2025** Study.
- Cebula, Richard J. "Federal Government Budget Deficits and Interest Rates: A Brief Note." *Southern Economic Journal*, January 1992.

- Cebula, Richard J., and James V. Koch. "Federal Budget Deficits, Interest Rates and International Capital Flows: A Further Note." *Quarterly Review of Economics and Finance* 34, no. 1 (Spring 1994).
- Cerniglia, Col James A., et al. "Special Operations." Second draft of white paper for **2025** Study.
- Cetron, Marvin. *74 Trends that will Affect America's Future-and Yours*. Bethesda, Md.: World Future Society, 1994.
- . *An American Renaissance in the Year 2000*. Bethesda, Md.: Future World Society, 1994.
- Cetron, Marvin, and Owen Davies. "50 Trends Shaping the World." Adapted from *Crystal Globe: The Haves and Have-Nots of the New World Order*. New York: St. Martin's Press, 1991.
- Chadha, K. K. "China's Grim Challenge." *Far Eastern Agriculture*, July/August 1993.
- Chan, Vincent W. S. "All-Optical Networks." *Scientific American*, September 1995.
- Chanda, Nayan. "Drifting Apart." *Far Eastern Economic Review*, 26 August 1993.
- . "Fear of the Dragon." *Far Eastern Economic Review*, 13 April 1995.
- Cirafici, Lt Col John L. *Airhead Operations*. Maxwell AFB, Ala.: Air University Press, 1995.
- Coleman, Fred. "Will Turkey Be the Next Iran?" *US News and World Report*, 6 June 1994.
- "Computer Scientists Rethink Their Disciplines Foundations." *Science* 269 (8 September 1995): 1363-1364.
- Concepts in Airpower for the Campaign Planner*. Maxwell AFB, Ala.: Air University, 1993.
- "Creating Shorter, Stronger Plants." *USA Today Magazine* 122, no. 2589 (June 1994): 7.
- Cremers, Hayo Canter, and Debora MacKenzie. "Europe Wrangles over Herman's Sex Life." *New Scientist* 136, no. 1849 (28 November 1992): 8.
- Currie, Lt Col Karen W., et al. "AFIT Logistics." Second draft of white paper for **2025** Study.

- Defense Base Closure and Realignment Commission. 1995 *Report to the President*. Arlington, Va.: The Defense Base Closure and Realignment Commission, 1995.
- Edgell, Judy L., et al. "Logistics." Second draft of white paper for **2025** Study.
- Eldridge, Daniel E. "China's Economic Reform and Military Modernization." Air War College paper, 20 February 1996.
- Elliot, Stuart. "The Cuervo Republic Will Have a Constitution But No 18th Amendment." *The New York Times*, 12 March 1996.
- Ellis, Joffe. "The PLA and the Chinese Economy." *Survival*, Summer 1995.
- Engelberger, Joseph F. "Robotics in the 21st Century." *Scientific American*, September 1995.
- Engelbrecht, Col Joseph A., Jr. "**2025** Alternate Futures Development." Briefing to **2025** study participants. Air War College, Maxwell AFB, Ala., 11 October 1995.
- . Personal interviews at the Shanghai Institute for Strategic Studies at Fudan University, Shanghai, and at the US consulates in Shanghai and Guangzhou, March 1996.
- Ettore, Barbara. "Heads You Lose, Tails You Don't Win." *Management Review*, August 1995.
- Fedarko, Kevin. "The Balkans: New Victims, New Victors." *Time Magazine* 146, no. 8 (21 August 1995): 48.
- Fellows, Lt Col James A., et al. "Airlift." Second draft of white paper for **2025** Study.
- Felman, Lt Col Marc D. "The Military-Media Clash and the New Principle of War: Media Spin." *Theater Air Campaign Studies*. Maxwell AFB, Ala.: Air Command and Staff College, 1995.
- Fisher, Jeffrey A. "Breakthroughs in Sight." *World Health* 47, no. 5 (September–October 1994): 20.
- FitzSimonds, Capt James R. (USN). "The Challenges of the RMA (Revolution in Military Affairs)." Lecture, Air Command and Staff College, Maxwell AFB, Ala., 11 April 1996.
- Fogleman, Gen Ronald. 231848Z December 94 CSAF message, Air Force 2025.

- Fogleman, Gen Ronald, Air Force chief of staff. Conversation with Lt Gen Jay W. Kelley, Air University commander, 13 February 96.
- Fourth Symposium on Global Change Studies* (Preprints). Boston: American Meteorological Society, 1993.
- Frosch, Robert A. "The Industrial Ecology of the 21st Century." *Scientific American* 273, no. 3 (September 1995): 178-180.
- Fund, John. "There is No Stopping the Information Revolution." *USA Today Magazine*, May 1995.
- Furth, Harold P. "Fusion." *Scientific American* 273, no. 3 (September 1995): 174.
- Fusco, Mike. "Next Wave in Bar Codes." *Logistics Spectrum* 28, no. 2 (Summer 1994): 2-3.
- "The Future of Medicine." *The Economist* 330, no. 7855 (19 March 1994): 54.
- Gallegos, Frank, and Jan Kinner. *World Water: War or Peace?* Strategic Structures Course Book, Volume one. Maxwell AFB, Ala.: Air Command and Staff College, Air University, 1995.
- "Garbage In, Business Out." *The Economist* 337, no. 7938 (28 October 1995): 94.
- Gates, William H. III. *The Road Ahead*. New York: Viking Penguin, 1995.
- Geis, John P. II. *Total Quality Management*. Maxwell AFB, Ala.: Air University, 1995.
- Gershon, Diane. "Genetically Engineered Foods Get Green Light." *Nature* 357, no. 6377 (4 June 1992): 352.
- Gilder, George. *Microcosm: The Quantum Revolution in Economics and Technology*. New York: Touchstone, 1989.
- Glass, E. Gray III. "Automation Ups Customer Service." *Gifts and Decorative Accessories*, April 1993.
- Goldstone, Jack A. "The Coming Chinese Collapse." *Foreign Policy*, Summer 1995.
- Graves, Jacqueline M. "Designer Genes Go for Your Plate." *Fortune* 132, no. 1 (10 July 1995): 22.
- Halloran, Richard. "The Rising East." *Foreign Policy*, Spring 1996.
- Hammond, Dr Allen L., et al. *World Resources 1994-95*. New York: The World Resources Institute, 1994.

- Hanke, Steve H. "Oil prices are going down." *Forbes* 157, no. 4 (26 February 1996): 140.
- Harding, Steve. *Soldiers* 49, no. 10 (October 1994): 13-17.
- Harte, John, and Daniel Lashof. "Bad weather? Just Wait." *New York Times*, 10 January 1996.
- Hartmann, Frederick H., and Robert L. Wendzel. *America's Foreign Policy in a Changing World*. New York: HarperCollins College Publishers, 1994.
- Hasen, Col Gerald, et al. 2025 technology team. Wright-Patterson AFB, Ohio: Air Force Institute of Technology, 9 April 1996.
- Hedges, Chris. "Fearing attack, US is tightening Bosnia security." *The New York Times*, 24 January 1996.
- Henderson, Diedtra. "Addicted to the Internet." *Atlanta Journal/Constitution*, 24 March 1996.
- Hill, Frederick J., and Gerald R. Peterson. *Digital Systems: Hardware Organization and Design*. New York: John Wiley and Sons, 1978.
- Hoagland, William. "Solar Energy." *Scientific American* 273, no. 3 (September 1995): 170.
- Holmes, Susan, and Judy Ballance. *The Process Improvement Guide: Quality Tools for Today's Air Force*, 2d ed. Maxwell AFB, Ala.: Air University, 1993.
- . *The Quality Approach*, 2d ed. Maxwell AFB, Ala.: Air University, 1993.
- Hook, Brian, and Denis Twitchett. *The Cambridge Encyclopedia of China*. Cambridge, England: Cambridge University Press, 1991.
- Hoover, Gary, et al. *Hoover's Handbook of American Business*. Austin, Tex.: The Reference Press, 1995.
- <http://ca94.election.digital.com/e/returns/prop/page.html/#prop-187>.
- http://spso.gsfc.nasa.gov/NASA_FACTS/ozone/ozone.html.
- <http://www-paradigm.asucla.ucla.edu/DB/Issues/95/11.27/news.prop187.html>.
- Huang, Yasheng. "Why China Will Not Collapse." *Foreign Policy*, Summer 1995.

- Hume, Brit, and T. R. Reid. "Citizens go online for information restricted by their governments: Leaders can't police Internet." *Atlanta Journal/Constitution*, 14 April 1996.
- Huntington, Samuel P. *The Third Wave*. Norman, Okla.: University of Oklahoma Press, 1991.
- "In 2010." *The Economist* 330, no. 7855 (19 March 1994): 15.
- Information Please Almanac, Atlas and Yearbook, 1996, 49th Edition*. New York: Houghton Mifflin Company, 1996.
- Institute for National Strategic Studies. *Strategic Assessment 1995*. Washington, D.C.: National Defense University, 1995.
- Ivins, Molly. "A Look at the Real State of the Union." *Atlanta Journal/Constitution*, 27 January 1996.
- Jane's Sentinel: The Unfair Advantage, Regional Security Assessment, North Africa, 1995 Edition*. Ed. by Paul Beaver. Surrey, U.K.: Jane's Information Group, 1994.
- Jennings, F. Peter W. *Energy Use and the Environment*. London: Lewis Publishers, 1991.
- Johnson, Cassius. "From Carbon to Diplomacy: A Sketch of the Interrelations Among Energy, Electric Power, the Economy, the Environment, Global Warming, and Foreign Policy in China, 1995-2025." Maxwell AFB, Ala.: Air War College Regional Studies Paper, 21 February 1996.
- Joint Cognitive Job Analysis System. Lecture to the **2025** Study participants, 18 October 1995.
- Joint Warfare of the US Armed Forces*. Washington, D.C.: National Defense University Press, 11 November 1991.
- Kawai, Kazuo. *Japan's American Interlude*. Chicago: University of Chicago Press, 1960.
- Kearns, Robert L. *Zaibatsu America: How Japanese Firms are Colonizing Vital US Industries*. New York: The Free Press, 1992.
- Kelley, Lt Gen Jay W. Interview with the 2025 study chairman about the alternate futures, 14 December 1995.
- Kellogg, William W. "Response to Skeptics of Global Warming." *The Bulletin of the American Meteorological Society*, April 1991.
- Kennedy, Paul. *Preparing for the Twenty-First Century*. New York: Random House, 1993.

- Khermouch, Gerry. "An Island of Their Own." *Brandweek* 37, no. 5 (29 January 1996).
- Kissinger, Henry. *Diplomacy*. New York: Touchstone Books, Simon and Schuster, 1994.
- Knight-Ridder Tribune. "Scientists: Too many resources consumed." *The Sunday Montgomery Advertiser*, 11 February 1996.
- Kopp, Will. *Vital Speeches of the Day*, vol. 60, no. 8, 244. Address delivered at Perry/Morgan County National Honor Society Recognition Conference, Zanesville, Ohio, 22 November 93.
- Krauthammer, Charles. *Time*. 21 February 1996.
- "Kurdish Militants Attack Turkish Sites in Europe." *Facts on File*. 1 July 1993.
- "Kurds Still Alone: Iraq's Neighbors." *The Economist*. 21 November 1992.
- LaFeber, Walter. *The American Century: American Foreign Policy Since the 1890s*. New York: W. W. Norton Publishing, 1989.
- Langer, Robert, and Joseph P. Vacanti. "Artificial Organs." *Scientific American* 273, no. 3 (September 1995): 130.
- Larrabee, John. "Private Alternative School Thrives Without Structure." *USA Today*, 7 February 1996.
- Lee, SukHun. "Relative Importance of Political Instability and Economic Variables on Perceived Country Creditworthiness." *Journal of International Business Studies*, Winter 1993.
- Lelyveld, Michael S. "Muted reaction to Belarus deal signals US shift." *Journal of Commerce and Commercial*, 21 July 1995.
- Lemonick, Michael D. "Heading for Apocalypse?" *Science*, 2 October 1995.
- . "The Last Frontier." *Time* 147, no. 7 (14 August 1995): 52.
- Leonpacher, Lt Col Norman K., et al. "Counter-Information." Second draft of white paper for **2025** Study.
- Levine, Art. "The Future is Bleak." *Esquire*, October 1993.
- . "The Future is Bright." *Esquire*, October 1993.

- Libicki, Martin C. "The Armed Forces 2020." Unpublished paper, 16 January 1996.
- Line, Les. "Acid Rain Leading to Moose Deaths." *The New York Times*, 12 March 96.
- "Living With California's Faults." *National Geographic Magazine* 187, no. 4 (April 1994).
- Lowry, Tom. "Outsourcing Expected to Increase." *USA Today*, 25 March 1996.
- Magyar, Dr Karl P. Interviews with one of the authors, Maxwell AFB, Ala., 9-10 April 1996.
- Marks, John. "Claiming a Piece of Iraq." *US News and World Report*, 9 November 1992.
- Marriott, Michel. "In a Cashless Future, Robots Will Cook." *The New York Times*, 24 January 1996.
- Marsa, Linda. "Boomers Only." *Omni*, October 1995.
- Marshall, Maj James P. "Near Real-Time Intelligence of the Tactical Battlefield." *Theater Air Campaign Studies Course Book*. Maxwell AFB, Ala.: Air Command and Staff College, 1996.
- Mason, Air Vice Marshal R. A. *Air Power: An Overview of Roles*. McLean, Va.: Pergamon-Brassey's International Defense Publishers, 1987.
- Matthews, Noah. "Some programs are designed for the very young." *Atlanta Journal / Constitution*, 24 March 1996.
- Mauldin, John H. "Reflections on the Sociology of Interstellar Travel." *Ad Astra* 7, no. 4 (July/August 1995): 48.
- Mayes, Col Marvin S., et al. "Operability and Defense." Second draft of white paper for **2025** Study.
- Meilinger, Col Phillip S. *10 Propositions Regarding Air Power*. Maxwell AFB, Ala.: School of Advanced Airpower Studies, 1995.
- Meister, John. "Waste Not, Want Not: Putting Wastewater To Work." *American City & County* 110, no. 1 (January 1995): 32.
- Miller, Lt Col Gregory J., et al. "Combat Support." Second draft of white paper for **2025** Study.
- Morgenthau, Hans J. *Politics Among Nations: The Struggle for Power and Peace*, 3d ed. New York: Knopf Publishers, 1972.

- Morris, David. "Risky Rush: Privatization Proceeding without Serious Debate." *Montgomery Advertiser*, 11 February 1996.
- Mueller, John. "Polly Principles for Unthreatened Wealth-Seekers." *Foreign Policy*, no. 102 (Spring 1996): 26.
- Murray, Douglas J. and Paul R. Viotta, eds. *The Defense Policies of Nations: A Comparative Study*. Baltimore, Md.: Johns Hopkins University Press, 1994.
- Music, Kimberly. "Rising US-Chinese Tensions Trigger Worries About Impact on Oil Projects." *The Oil Daily*, 12 February 1996.
- National Aeronautics and Space Administration (NASA) Internet pages. On-line, Internet, 15 March 1996, available from http://spso.gsfc.nasa.gov/NASA_FACTS/ozone/ozone.html.
- The National Military Strategy of the United States of America*. Washington, D.C.: US Government Printing Office, 1995.
- National Reconnaissance Office (NRO) personnel remarks following *Alternate Futures* briefing on 22 January 1996.
- National Report of the People's Republic of China on Environment and Development*. Beijing: China Environmental and Science Press, 1992.
- Negroponte, Nicholas. *Being Digital*. New York: Vintage Books, 1995.
- Neurath, Paul. *From Malthus to the Club of Rome and Back*. Armon, N.Y.: M. E. Sharpe, 1994.
- The New Encyclopaedia Britannica*. 15th ed., 1991, vol. 26, Macropeadia, 748(2)a.
- Newman, Peter C. "The Way to the Number One Market." *Nation's Business*, 1 October 1994.
- Newman, Steve. "Rabbit Viruses." *Atlanta Journal/Constitution*, 3 February 1996.
- "The Next Wave: Aquaculture." *Scientific American* 273, no. 3 (September 1995): 185.
- "Nicer and Nicer: Ukraine." *The Economist*, 8 April 1995.
- Nixon, Richard M. *Beyond Peace*. New York: Random House, 1994.
- Noble, Kenneth B. "Defying Airwave Rules and Exporting the Way." *The New York Times*, 24 January 96.

- Nollinger, Mark. "America, On-Line." *Wired* 3, no. 9 (September 1995): 158.
- "Nuclear Non-Proliferation: Between the Bomb and a Hard Place." *The Economist* 334, no. 7907 (25 March 1995): 23.
- Nye, Joseph S., and William A. Owens. "America's Information Edge." *Foreign Affairs* 75, no. 2 (March-April 1996): 20.
- Oech, Roger von. *A Kick in the Seat of the Pants*. New York: Harper and Row Publishers, 1986.
- Olesen, Douglas E. "The Top 10 Technologies for the Next 10 Years." *The Futurist* 29, no. 5 (September-October 1995): 9.
- Ottman, Lt Col Charles B., et al. "Interdiction." Second draft of white paper for **2025** Study.
- Owens, Adm William A. "The Emerging System of Systems." Maj Glenn Cobb, ed. *Theater Air Campaign Studies*. Maxwell AFB, Ala.: Air Command and Staff College, 1995.
- . "A Report on the JROC and the Revolution in Military Affairs." Maj Glenn Cobb, ed. *Theater Air Campaign Studies*. Maxwell AFB, Ala.: Air Command and Staff College, 1995.
- Papp, Daniel S. *Contemporary International Relations*. New York: Macmillan College Publishing Co., 1994.
- "Partners for what?" *The Economist*, 24 September 1994.
- Patterson, David A. "Microprocessors in 2020." *Scientific American* 273, no. 3 (September 1995): 62.
- Patton, Phil. "Robots with the Right Stuff." *Wired*, March 1996.
- Peacock, Jim. "Twenty-first Century Crops." *Nature* 357, no. 6377 (4 June 1992): 358.
- "Pest-Resistant Seeds Foil Insects." *USA Today Magazine* 123, no. 2601 (June 1995): 13.
- Petersen, John L. *The Road to 2015: Profiles of the Future*. Corte Madera, Calif.: Waite Group Press, 1994.
- Platt, Charles. "The Museum of Nanotechnology: Tiny and Great Leaps for the Human Race." *Wired Scenarios, Special Edition* 1.01 (1995).
- . "Super Humanism." *Wired* 3, no. 10 (October 1995): 144.
- Poppela, Jessica. "The CFC Challenge." *The China Business Review*, July-August 1994.

- Population Division, Department for Economic and Social Information and Policy Analysis. *World Population Growth from Year 0 to Stabilization*. New York: United Nations, mimeograph, 7 June 1994.
- Post, Tom. "The Great Game: Chapter Two." *Newsweek*, 3 February 1992.
- Preprints to the Fourth Symposium on Global Change Studies. (Over 100 various authors.) *American Meteorological Society*, 1993.
- Prince, James M. "A Kurdish State in Iraq?" *Current History*, January 1993.
- Rast, Vicki J., and Maj Bruce R. Sturk. *Coalitions: The Challenge of Effective Command and Control in Support of the Air Campaign*. Maxwell AFB, Ala.: Theater Air Campaign Studies, 1996.
- "Reclaimed Water Requires Homework First." *American City & County* 110, no. 11 (October 1995): 34.
- Redden, Maj Gen Joseph J. "RMA: A View from the Inside." Lecture, Air Command and Staff College, Maxwell AFB, Ala., 11 April 1996.
- Rennie, John. "The Uncertainties of Technological Innovation." *Scientific American* 273, no. 3 (September 1995): 43-44.
- Richman, Louis S. "Why Baby Boomers Won't Be Able to Retire." *Fortune*, 4 September 1995.
- Rosenberg, Nathan. "Trying to Predict the Impact of Tomorrow's Inventions." *USA Today Magazine*, May 1995.
- Rosent, John, and John Dosey. "Turkey may have brought itself a world of trouble." *Business Week*, 10 April 1995.
- Ross, David. "Not Drowning But Waving." *New Statesman & Society* 9, no. 385 (12 January 1996): 30.
- Ross, Philip E. "Software as Career Threat." *Forbes*, 22 May 1995.
- "Russia, Belarus to Form Union." *Montgomery Advertiser*, 3 April 1996.
- Ryan, Lt Col Donald E. *The Airship's Potential for Intertheater and Intratheater Airlift*. Maxwell AFB, Ala.: Air University Press, 1993.
- Savage, Marshall T. "Dawn of a New Millennium." *Ad Astra* 7, no. 4 (July/August 1995): 40.

- "Savior of the Plague Years." *Wired Scenarios, Special Edition* 1.01 (1995).
- Schwartau, Winn. *Information Warfare*. New York: Thunder's Mouth Press, 1994.
- Schwartz, Peter. *The Art of the Long View*. New York: Currency Doubleday, 1991.
- Scripps Howard News. "Medical Researchers Foresee Rosey Future." *Montgomery Advertiser*, 11 February 1996.
- Seabrook, Charles. "Hotlanta gets hotter as trees fall to development." *Atlanta Constitution*, 27 March 1996.
- Sebald, William J., with Russell Brines. *With MacArthur in Japan*. New York: W. W. Norton & Co., Inc., 1965.
- Selimuddin, Abu. "China: The Biggest Dragon of All?" *USA Today*, September 1994.
- Shields, Lt Col William B., et al. "Weather Modification." Second draft of white paper for **2025** Study.
- Shirkhani, M. A. Shahriar, and Constantine P. Danopoulos. "Iran-Iraq: Protracted Conflict, Prolonged War." In Karl P. Magyar, et al., *Prolonged Wars: a Post-Nuclear Challenge*. Maxwell AFB, Ala.: Air University Press, 1994.
- Shortridge, Kennedy F. "The Next Pandemic Influenza Virus?" *The Lancet* 346, no. 8984 (4 November 1995).
- Silver, Cheryl S., and Ruthe S. DeFries. *One Earth, One Future: Our Changing Global Environment*. Washington, D.C.: National Academy Press, 1990.
- Slusar, Robert T. "The Environmental Plight in China." Air War College paper, 12 February 1996.
- Smil, Vaclav. *China's Environmental Crisis*. Armonk, New York: M. E. Sharpe, 1993.
- . "Feeding China." *Current History*, September 1995.
- Smith, Col Yoshio, et al. "Aerospace Replenishment." Second draft of white paper for **2025** Study.
- Smith, Craig S., and Marcus W. Bracchli. "Despite Rapid Growth of China's Economy, Many are Suffering." *The Wall Street Journal*, 18 October 1995.
- Smith, Kevin C. *Response Surface Study of Fatigue in Ferroelectric Memory Devices*. Wright-Patterson AFB, Ohio: Air Force Institute of Technology, 1992.

- Spacecast 2020. *Into the Future: The World of 2020 and Alternate Futures*. Maxwell AFB, Ala.: Air University, 1994.
- Spacecast 2020: *Operational Analysis*. Maxwell AFB, Ala.: Air University, 1994.
- Spence, Johnathan D. *The Search for Modern China*. New York: W. W. Norton & Co., 1990.
- Statistical Abstract of the United States 1995*. Washington, D.C.: US Government Printing Office, 1995.
- Statistical Yearbook, Thirty-Ninth Issue*. New York: Department for Economic and Social Information and Policy Analysis, Statistical Division, United Nations, 1992.
- Stein, George J. "Information War - Cyberwar - Netwar." In Barry Schneider and Lawrence Grinter, eds., *Battlefield of the Future*. Maxwell AFB, Ala.: Air University Press, 1995.
- Stephenson, Neal. *The Diamond Age*. New York: Bantam Books, 1995.
- Sterling, Bruce. *Islands In The Net*. New York: Ace Books, 1988.
- Stevens, Tim. "Do You Believe in Magic." *Industry Week*, 21 August 95.
- Strategic Assessment 1995: US Security Challenges in Transition*. Washington, D.C.: Institute for National Strategic Studies, 1995.
- Stremlau, John. "Dateline Bangalore: Third World Technopolis." *Foreign Policy*, Spring 1996.
- "Swords into Plowshares." *Discover* 16, no. 11 (November 1995): 36.
- Sycalik, Gary. "Wildcards." Briefing to **2025** participants, Air War College, Maxwell AFB, Ala., 6 September 1995.
- Szekely, Julian, and Gerardo Trapaga. "From Villain To Hero (Materials Industry's Waste Recovery Efforts)." *Technology Review* 98, no. 1 (January 1995): 30-36.
- "Teheran Tied to Turkish Terrorists." *Facts on File*, 11 March 1993.
- Terrazas, Michael. "Report Outlines Global Waste Reduction Efforts." *American City & County* 110, no. 10 (September 1995): 16-19.

- Thieret, Lt Col Jeffrey E., et al. "Strategic Attack." Second draft of white paper for **2025** Study.
- Thomas, Charles. 14 February 96 interview with Col Joseph Engelbrecht.
- "Through the Glass Lightly." *Science* 267 (17 March 95).
- Toffler, Alvin, and Heidi Toffler. *War and Anti-War: Survival at the Dawn of the 21st Century*. New York: Little, Brown and Co., 1993.
- . "Getting Set for the Coming Millenium." *The Futurist*, March–April 1995.
- Tooles, Michael J. "Are War and Public Health Compatible." *The Lancet*, 8 May 1993.
- "The Treaty that Worked Almost." *Scientific American*, September 1995.
- Tyler, Patrick E. "As China Threatens Taiwan, it Makes Sure US Listens." *The New York Times*, 24 January 1996.
- Umez, Bedford N. "Has Social Mobilization Caused Political Instability in Africa? A Granger Causality Test." *The Review of Black Political Economy*, Summer 1993.
- "UN Reports on A-arms Threat." *Facts on File*, 5 March 1992.
- University of California at Los Angeles Department of Law. On-line, Internet, 15 March 1996, available from <http://www-paradigm.asucla.ucla.edu/DB/Issues/95/11.27/news.prop187.html>.
- Urias, Lt Col John M., et al. "Planetary Defense." Second draft of white paper for **2025** Study.
- USAF Scientific Advisory Board. *New World Vistas: Air and Space Power for the 21st Century*, Summary Volume. Washington, D.C.: USAF Scientific Advisory Board, 15 December 1995.
- Varni, Lt Col Jamie G., et al. "Space Operations." Second draft of white paper for **2025** Study.
- "Wait and See." *Far Eastern Economic Review*, 31 August 1995.
- Walker, Tom. "Bulls Beware When Boomers Cash In." *Atlanta Constitution*, Sunday, 24 March 1996.
- Waller, Douglas. "Onward Cyber Soldiers." *Time* 146, no. 8 (21 August 1995): 38.

- Warden, Col John A., et al. *Concepts in Airpower for the Campaign Planner*. Maxwell AFB, Ala.: Air University Press, 1993.
- Watson, Russell. "So Who Needs Allies?" *Newsweek*, 15 May 1995.
- Webb, Jeremy. "Tide of Optimism Ebbs Over Underwater Windmill." *New Scientist* 138, no. 1870 (24 April 1993): 10.
- . "Wave Energy Project Hangs in the Balance." *New Scientist* 140, no. 1896 (23 October 1993): 8.
- The White House. *A National Security Strategy of Engagement and Enlargement*. Washington, D.C., February 1995.
- Willette, Anne. "Tax software acts as drawing card." *USA Today*, 16 February 1996.
- Wolf, Eric R. *Peasant Wars of the Twentieth Century*. New York: Harper & Row, 1969.
- Wood, Fred B. "Monitoring Global Climate Change: The Case of Greenhouse Warming." *The Bulletin of the American Meteorological Society*, January 1990.
- The World Factbook*. Washington, D.C.: Central Intelligence Agency, 1995.
- "World in Brief: Space Station Push." *Atlanta Journal/Constitution*, 27 March 1996.
- Worldwide Bioelectronics Collection Guide* (U). (Director of Central Intelligence, December 1988). (Secret) Information extracted is Unclassified.
- Worsnop, Richard L. "Indoor Air Pollution." *CQ Researcher* 5, no. 40 (27 October 1995): 947.
- Wriston, Walter B. *The Twilight of Sovereignty: How the Information Revolution is Transforming Our World*. New York: Scribner Publishers, 1992.
- Yanan, Ju. (China) "The Fourth Power, Retired Officer Association National Security Report." *The Officer*, December 1994.
- Yearbook of the United Nations 1993*. Boston, Mass.: Martinus Nijhoff Publishers, 1994.
- Zimmer, Carl. "Verdict (Almost) In." *Discover*, January 1996.
- Zysman, George I. "Wireless Networks" and "Wireless Telephony for Developing Countries." *Scientific American* 273, no. 3 (September 1995): 68.